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February 1994

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

This publication was prepared by the NASA Center for AeroSpace Information,
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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 536 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	N94-10001 — N94-18414
International Aerospace Abstracts (IAA) (A-10000 Series)	A94-10001 — A94-11840

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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Category 55 Space Biology 92
Includes exobiology; planetary biology; and extraterrestrial life.

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → N94-11045*# Pennsylvania State Univ., Hershey. Coll. of Medicine. ← CORPORATE SOURCE

TITLE → EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992

AUTHOR → WALTER B. SEVERS 31 Dec. 1992 32 p ← PUBLICATION DATE

CONTRACT NUMBER → (Contract NCC2-127)

REPORT NUMBERS → (NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF A01 ← AVAILABILITY AND PRICE CODE

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonent with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on subcommissural organ; and (4) research on the eye.

Author (revised)

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → A94-11095

TITLE → SEA-LEVEL P(CO2) RELATES TO VENTILATORY ACCLIMATIZATION AT 4,300 M

AUTHORS → JOHN T. REEVES, ROBERT E. MCCULLOUGH, LORNA G. MOORE, ALLEN CYMERMAN, and JOHN V. WEIL (Colorado Univ., Denver; U.S. Army, Research Inst. of Environmental Medicine, Natick, MA) ← AUTHORS' AFFILIATION

Journal of Applied Physiology (ISSN 8750-7587) ← JOURNAL TITLE

vol. 75, no. 3 Sept. 1993 p. 1117-1122. refs ← PUBLICATION DATE

CONTRACT NUMBER → (Contract DAMD81-C-1057; DAMD17-91-C-1112; NIH-HL-14985) Copyright

The hypothesis of Hirshman et al. (1978) and Weil (1986) that the large (over an eightfold range) individual variations in the strength of the hypoxic ventilatory response (HVR) observed in the laboratory are related to ventilatory acclimatization to altitude was tested. End-tidal P(CO2) values were measured in 37 resting subjects at sea level (showing a 34-48 Torr range) and after the subjects were taken to Pikes Peak (4300 m), with measurements made on arrival and repeatedly over 19 days. It was found that, at 4300 m, subjects with high end-tidal P(CO2) had low values of arterial oxygen saturation, Sa(O2), and that sea-level end-tidal P(CO2) related to Sa(O2) after 19 days at 4300 m. The end-tidal P(CO2) values on arrival and after 19 days at 4300 m were inversely related to the sea-level HVR values.

AIAA

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 385)

February 1994

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LIFE SCIENCES (GENERAL)

A94-10024
MAGNETITE FORMATION BY A SULPHATE-REDUCING BACTERIUM
TOSHIFUMI SAKAGUCHI, J. G. BURGESS, and TADASHI MATSUNAGA (Tokyo Univ. of Agriculture and Technology, Koganei, Japan) Nature (ISSN 0028-0836) vol. 365, no. 6441 Sept. 2, 1993 p. 47-49. refs
Copyright

The isolation and pure culture of dissimilatory sulfate-reducing bacterium which can synthesize intracellular magnetite particles is reported. This illustrates the wider metabolic diversity of magnetic bacteria and suggests the presence of a novel mechanism of magnetic biomineralization. The discovery of such bacteria may also explain why large quantities of magnetite have been observed in sulfate-rich oil-bearing sedimentary deposits. These results significantly enlarge the environment in which biogenic magnetite may be expected to occur and have important implications regarding the evolution of the ability to synthesize magnetite.
AIAA

A94-10129 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
BIOGEOCHEMICAL CYCLES OF CARBON, SULFUR, AND FREE OXYGEN IN A MICROBIAL MAT
DONALD E. CANFIELD and DAVID J. DES MARAIS (NASA, Ames Research Center, Moffett Field, CA) Geochimica et Cosmochimica Acta (ISSN 0016-7037) vol. 57, no. 16 Aug. 1993 p. 3971-3984 Research supported by NASA and National Research Council refs
Copyright

Complete budgets for carbon and oxygen have been constructed for cyanobacterial mats dominated by Microcoleus chthonoplastes from the evaporating ponds of a salt works. We infer from the data the various sinks for O2 as well as the sources of carbon for primary production. Although seasonal variability exists, a major percentage of the O2 produced during the day did not diffuse out of the mat but was used within the mat to oxidize both organic carbon and the sulfide produced by sulfate reduction. At night, most of the O2 that diffused into the mat was used to oxidize sulfide, with O2 respiration of minor importance. During the day, the internal mat processes of sulfate reduction and O2 respiration generated as much or more inorganic carbon (DIC) for primary production as diffusion into the mat. Oxygenic photosynthesis was the most important process of carbon fixation. At night, the DIC lost from the mat was mostly from sulfate reduction. Elemental fluxes across the mat/brine interface indicated that carbon with an oxidation state of greater than zero was taken up by the mat during the day and liberated from the mat at night. Overall, carbon with an average oxidation state of near zero accumulated in the mat. Both carbon fixation and carbon oxidation rates varied with temperature by a similar amount.
Author (revised)

A94-10511
EFFECTS OF ORTHOSTATIC AND ANTI-ORTHOSTATIC STRESS ON PATENT AND STENOTIC CORONARY ARTERIES IN SWINE
ROBERT A. SCHMITZ (Uniformed Services Univ. of the Health Sciences, Bethesda, MD), F. A. GAFFNEY (Texas Univ., Dallas), DEBBIE M. SCANDLING, and JACK E. MCKENZIE (Uniformed Services Univ. of the Health Sciences, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 839-844. Research supported by Uniformed Services Univ. of the Health Sciences refs
Copyright

The effects of head-up tilt (HUT) and head-down tilt (HDT) on the coronary circulation of pigs before and during coronary stenosis are investigated. Seven pigs were placed in the prone position and exposed to the following orientations for 20 min each: 0 deg horizontal, +70 deg HUT, and -15 deg HDT. The pigs were then placed in the HZ position for 20 min while hemodynamics returned to baseline. The diameter of the left anterior descending coronary artery was reduced to a point slightly less than that which produced a decrease in blood flow, and the protocol was repeated. A substantial increase in coronary blood flow during HUT to HDT with and without coronary stenosis is demonstrated. However, the elevated coronary sinus lactate concentrations during HDT with coronary stenosis indicates either an increased lactate production or a decreased lactate utilization. The pig model for gravitational cardiovascular research is validated, and it is inferred that coronary stenosis may decrease lactate extraction and consumption during the hemodynamic stress of orbital insertion.
AIAA

A94-11025
CORRECTION OF THE MINERAL COMPOSITION OF TISSUES DURING THE RESTORATION PERIOD AFTER HYPOKINESIS UNDER THE INFLUENCE OF HIGH TEMPERATURE [KORREKTSIYA MINERAL'NOGO SOSTAVA TKANEJ V VOSSTANOVITEL'NOM PERIODE POSLE GIPOKINEZII, PROVODIMOJ PRI VOZDEJSTVII VYSOKOJ TEMPERATURY]
Z. T. TURSUNOV and M. D. PULATOVA (ANUz, Inst. Fiziologii i Biofiziki, Tashkent, Uzbekistan) Akademiya Nauk Respubliki Uzbekistan, Doklady, Matematika, Tekhnicheskie Nauki, Estestvoznanie (ISSN 0134-4307) no. 2 1993 p. 53-55. In RUSSIAN refs
Copyright

The paper presents the results of measurements of Na(+) and K(+) changes in tissues of visceral organs and in the water-salt depot of rats during 30 days of recovery after repeated exposures to hypokinesia (2 hrs daily at 38-40 C for 60 days), when the animals were given either tap water or an electrolyte-glucose solution (0.4 g NaCl, 1.8 g KCl, 0.13 CaCl2, and 21.5 g glucose per liter). It is found that the use of the electrolyte-glucose solution speeded up the restoration to normal mineral content in the intestinal tract, skin, and myocardium but not in the kidneys, liver, and stomach.
AIAA

A94-11097
ROLE OF PROTEIN INTAKE ON PROTEIN SYNTHESIS AND FIBER DISTRIBUTION IN THE UNWEIGHTED SOLEUS MUSCLE
D. TAILLANDIER, X. BIGARD, D. DESPLANCHES, D. ATTAIX, C. Y. GUEZENNEC, and M. ARNAL (INRA, Lab. d'Etude du

Metabolisme Azote, Ceyrat; Centre d'Etudes et des Recherches de Medecine Aerospatiale, Bretigny-sur-Orge; Lyon I, Univ., France) Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1226-1232. Research supported by Ministere de la Recherche et de la Technologie of France refs
Copyright

The effect of protein intake on protein synthesis in the atrophied soleus muscle was investigated in rats subjected to 21 days of hindlimb unweighting and provided with either a high-protein (30 percent, HP) or a medium-protein (15 percent, MP) diet. The fractional rate of protein synthesis (k(s)) was determined in vivo in the slow-twitch soleus muscle, using a flooding-dose method. It was found that in MP rats, a significant reduction of k(s) took place, whereas in HP rats, the k(s) was small and not significant. Whereas in the atrophied soleus of MP rats, a 42 percent decrease occurred in type I fiber distribution, accompanied by an increase in intermediate type IIa fibers, a higher percentage of type I fiber was maintained with the HP diet. However, the HP diet had no beneficial effect in preventing the decrease in either type I fiber cross-sectional area or the average decrease in absolute myofibrillar and mitochondrial volumes. The results indicate that an HP intake does not prevent soleus muscle atrophy but may sustain protein synthesis and partly preserve fiber type distribution, without affecting the ultrastructural composition of fibers. AIAA

A94-11143* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE VALUE AND POTENTIAL OF ANIMAL RESEARCH IN ENABLING ASTRONAUT HEALTH - TRANSITION FROM SPACELAB TO SPACE STATION FREEDOM
V. GARSHNEK (Lockheed Engineering and Sciences Co., Moffett Field, CA) and R. W. BALLARD (NASA, Ames Research Center, Moffett Field, CA) Oct. 1993 6 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-140) Copyright

Maintaining astronaut health is a critical aspect of human space exploration. Three decades of space research have demonstrated that microgravity produces significant physiological changes in astronauts. For long-duration missions, the possibility exists that these changes may prevent the achievement of full health and safety and may therefore require countermeasures. Meeting this goal depends on a strong biomedical foundation. Although much research is conducted with humans, some of the most critical work involves a necessary in-depth look into complex problem areas requiring invasive procedures using animals. Much of this research cannot be performed in humans within the bounds of accepted medical practice. A large portion of knowledge and experience in flying animals and applying the data to astronaut health has been obtained through the Spacelab experience and can be applied to a space station situation (expanded to accommodate necessary standardization and flexibility). The objectives of this paper are to (a) discuss the value and potential of animal research in answering critical questions to enable astronaut health for advanced missions, (b) discuss how previous Spacelab operational experience in animal studies can be applied to facilitate transition into a space station era, and (c) review capabilities of biological facilities projected for Space Station Freedom.

A94-11144
TELESCIENCE BIOMEDICAL STUDIES - FERTILIZATION POTENTIAL RECORDING OF AMPHIBIAN EGGS USING TELE-MANIPULATION UNDER STEREOSCOPIC VISION
S. WATANABE, Y. WADA, H. SUZUKI, S. TAKAGI (Nagoya Univ., Japan), K. FUKAI, Y. KANAZAWA, M. TAKAGI (Shimadzu Corp., Kyoto, Japan), K. HIRAKAWA, K. OGASAHARA, K. TUMURA (Fujitsu, Ltd., Tokyo, Japan) et al. Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(Contract MOESC-04557007)
(IAF PAPER 93-141) Copyright

A telescience testbed experiment intended to record the fertilization potential of amphibian eggs using a microelectrode technique is described. Telemanipulation was used in conjunction with a stage control for focusing a microscope and a micromanipulator control for driving a microelectrode capilary, being operated by PI in the control room. The control for focusing a microscope and inserting a capillary electrode into an egg was tested by PI with a head mounted display capable of showing stereoscopic images of the objects, amphibian eggs, and the electrode tip. AIAA

A94-11145
THE DIFFERENT EFFECTS OF HYPOKINESIA ON INSULIN RECEPTORS IN VARIOUS TISSUES OF RATS
L. MACHO, M. FICKOVA, and E. SVABOVA (Slovak Academy of Sciences, Inst. of Experimental Endocrinology, Bratislava, Slovakia) Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-144) Copyright

Rats exposed to hypokinesia were used to study tissue differences of insulin receptors in animals exposed to the space flight environment. Insulin receptors were estimated in isolated adipocytes, hepatocytes, and red blood cells. Despite the decline of insuline receptors in adypocites after 1-day hypokinesia, no concomitant changes in insulin stimulation of glucose transport were observed. Though the insulin binding remained unchanged the hormone effect on glucose transport after 7-day hypokinesia was observed in rat adipocytes. It is concluded that there are differences in the changes of insulin receptors in various tissues after short-term hypokinesia, and dissociation between insulin binding and insulin postreceptor action in fat cells during hypokinesia. AIAA

A94-11146
PLANT CELL GROWTH AND DIFFERENTIATION IN REAL AND SIMULATED MICROGRAVITY
E. L. KORDYUM (Ukrainian Academy of Sciences, Inst. of Botany, Kiev, Ukraine) Oct. 1993 9 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-147) Copyright

The characteristics of structural and functional rearrangements taking place in a plant cell during growth and differentiation in real and simulated microgravity are examined on examples of algae and higher plants grown in space and under clinostating. Particular attention is given to the regularities in organnelle rearrangements, and changes in the rate of cellular biological processes and in physical and chemical properties of plasmalemma under these conditions. The effects of these changes and their regularity on the resistance and adaptation of plant cell to microgravity are discussed. AIAA

A94-11160
DEVELOPMENT OF A CENTRIFUGE FOR ACCELERATION RESEARCH IN CELL AND DEVELOPMENTAL BIOLOGY
J. J. W. A. VAN LOON (Academic Center for Dentistry, Amsterdam, Netherlands), L. C. VAN DEN BERGH, R. SCHELLING (Fokker Space and Systems, Amsterdam, Netherlands), J. P. VELDHUIJZEN (Academic Center for Dentistry, Amsterdam, Netherlands), and R. H. HUIJSER (Fokker Space and Systems, Amsterdam, Netherlands) Oct. 1993 8 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by SRON refs
(IAF PAPER 93-166) Copyright

A dedicated centrifuge facility for cell, tissue culture, and developmental biology experiments called Centrifuge for Acceleration Research (MidiCAR) is described. The centrifuge intended to perform experiments using both standard laboratory and space flight hardware can be used in hypergravity experiments to reveal the mechanisms involved in whole animals or plants, tissues, and cells in response to gravity changes. The centrifuge makes it possible to perform a range of experiments at relatively low cost and facilitates their space flight preparations. AIAA

A94-11621
BEHAVIOR OF THE FISH MEDAKA UNDER MICROGRAVITY

2

KENICHI IJIRI (Tokyo Univ., Japan) JASMA - Japan Society of Microgravity Application, Journal (ISSN 0915-3616) vol. 10, no. 3 1993 p. 158-166. In JAPANESE refs
Copyright

As one of the space biology experiments for the second International Microgravity Laboratory mission scheduled in the summer of 1994, the project 'Mating behavior of the fish, medaka' (project name MEDAKA) has been selected. For the preliminary experiment, parabolic flights were carried out to observe the fish behavior under micro-G for five different inbred strains of medaka. There existed a clear strain difference in the behavioral response of the fish under micro-G and light conditions: some strains looped and other strains did not. However, under RG and dark conditions, all the fish of the five strains did loop. This indicates that fish use visual senses in controlling their posture under micro-G. In the laboratory visual acuity is checked for each strain and also for F1 generation between two strains using a rotating striped-drum apparatus. Author (revised)

N94-10120*# Space Hardware Optimization Technology, Inc., Floyds Knobs, IN.
DESIGN OF MULTISAMPLE, MULTISTEP PHASE PARTITIONING APPARATUS FOR USE ON SPACE SHUTTLE SPACELAB, AND SPACELAB MISSIONS
MARK S. DEUSER, JAMES M. VANALSTINE (Alabama Univ., Huntsville.), JOHN C. VELLINGER, FRANCIS C. WESSLING (Alabama Univ., Huntsville.), and CHARLES A. LUNDQUIST (Alabama Univ., Huntsville.) *In* ESA, Proceedings of the 8th European Symposium on Materials and Fluid Sciences in Microgravity, Volume 1 p 337-341 Aug. 1992
(Contract NAGW-812; NAGW-1196)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Traditional separation techniques are inadequate for many new bioprocessing challenges. Innovative separation methods such as aqueous two phase partitioning are needed to perpetuate bioprocess commercialization. Aqueous two phase polymer partitioning systems provide a process for separating biological materials when combined with microgravity. An innovative space qualified apparatus developed for carrying out separations by partitioning in immiscible polymer systems under mirogravity conditions is described. The apparatus offers an innovative approach to low gravity bioseparations in general and phase partitioning in particular. These capabilities support NASA's interest in serving the biotechnology research community and providing quantitative data in the gravity dependent components of separation processes. ESA

N94-10360*# Sverdrup Technology, Inc., Huntsville, AL.
MICROBIOLOGICAL TEST RESULTS USING THREE URINE PRETREATMENT REGIMES WITH 316L STAINLESS STEEL
TIMOTHY L. HUFF Jul. 1993 19 p Original contains color illustrations
(Contract NAS8-37814)
(NASA-CR-192568; NAS 1.26:192568) Avail: CASI HC A03/MF A01; 2 functional color pages

Three urine pretreatments, (1) Oxone (Dupont) and sulfuric acid, (2) sodium hypochlorite and sulfuric acid, (3) and ozone, were studied for their ability to reduce microbial levels in urine and minimize surface attachment to 316L stainless steel coupons. Urine samples inoculated with Bacillus insolitus and a filamentous mold, organisms previously recovered from the vapor compression distillation subsystem of NASA Space Station Freedom water recovery test were tested in glass corrosion cells containing base or weld metal coupons. Microbial levels, changes in pH, color, turbidity, and odor of the fluid were monitored over the course of the 21-day test. Specimen surfaces were examined by scanning electron microscopy at completion of the test for microbial attachment. Ozonated urine samples were less turbid and had lower microbial levels than controls or samples receiving other pretreatments. Base metal coupons receiving pretreatment were relatively free of attached bacteria. However, well-developed biofilms were found in the heat-affected regions of welded coupons receiving Oxone and hypochlorite pretreatments. Few bacteria were observed in the same regions of the ozone pretreatment sample. Author (revised)

N94-10652# Cornell Univ., Ithaca, NY.
CONVERSION OF ACETIC ACID TO METHANE BY THERMOPHILES
S. H. ZINDER 1993 13 p
(Contract DE-FG02-85ER-13370)
(DE93-014433; DOE/ER-13370/T2) Avail: CASI HC A03/MF A01

The primary goal of this project is to obtain a better understanding of thermophilic microorganisms which convert acetic acid to CH4. The previous funding period represents a departure from earlier research in this laboratory which was more physiological and ecological. The present work is centered on the biochemistry of the thermophile Methanothrix sp. strain CALS-1. This organism presents a unique opportunity, with its purity and relatively rapid growth, to do comparative biochemical studies with the other major acetotrophic genus Methanosarcina. We previously found that Methanothrix is capable of using acetate at concentrations 100 fold lower than Methanosarcina. This finding suggests that there are significant differences in the pathways of methanogenesis from acetate in the two genera. DOE

N94-10888 Kyoto Univ., Kumatori (Japan). Research Reactor Inst.
PROCEEDINGS OF THE SYMPOSIUM ON RADIATION RESEARCH IN LIFE SCIENCE
TAKAJI IKUSHIMA, ed. May 1992 81 p Symposium held in Kumatori, Japan, 16-17 Jan. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE93-754137; KURRI-TR-363; CONF-9201125) Avail: Issuing Activity (Department of Energy (DOE))

This issue is the collection of the papers presented at the Symposium on Radiation Research in Life Science. The 9 presented papers are indexed individually. DOE

N94-11020# Maryland Univ., College Park.
ALUMINUM AND MEMBRANE CHANNELS
M. COLOMBINI 21 May 1993 8 p
(Contract N00014-90-J-1024)
(AD-A265241) Avail: CASI HC A02/MF A01

This publication is an invited chapter for a book dedicated to the actions of aluminum in biological systems. This contribution focuses on the effects of aluminum on voltage dependent anion-selective channels. This is a summary of results published in other journals by people in my laboratory. DTIC

N94-11045*# Pennsylvania State Univ., Hershey. Coll. of Medicine.
EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992
WALTER B. SEVERS 31 Dec. 1992 32 p
(Contract NCC2-127)
(NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF A01

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonent with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on

subcommissural organ; and (4) research on the eye.
Author (revised)

N94-11180*# Illinois Univ., Urbana-Champaign. Bioenvironmental Engineering Research Lab.
EFFECT OF DOUBLE DENSITY CAGING DURING SPACE SHUTTLE TRANSPORT OF LABORATORY RATS Final Report
G. L. RISKOWSKI, H. W. GONYOU, P. C. HARRISON, K. W. KELLEY, and M. E. TUMBLESON 22 Jun. 1993 100 p
(Contract NAG2-736)
(NASA-CR-193228; NAS 1.26:193228) Avail: CASI HC A05/MF A02; 1 functional color page

Male Sprague Dawley rats were housed in groups of four in polycarbonate cages at recommended density and thermal environmental conditions for 14 days prior to testing to ensure uniform acclimation to those conditions. Body weights averaged 286 +/- 7 g at the end of acclimation. Rat cages were assigned randomly to three treatments: (1) 4 rats/polycarbonate cage (877 sq cm, 20.3 cm high, 220 sq cm/rat), (2) 4 rats/mock AEM (MAEM) (620 sq cm, 155 sq cm/rat), and (3) 8 rats/MAEM (620 sq cm, 77.5 sq cm/rat). A comparison between the MAEM-DD and MAEM-SD treatments was done to determine if doubling rat density in AEM's stressed the rats. A comparison among MAEM treatments and the PC treatment was done to determine if any stress indications were due to the AEM. During this density challenge phase, all treatments were maintained at the same thermal environmental conditions (22.5 C and 50 percent RH) for 10 days. After the density challenge phase, half the rats from each group were sacrificed for body tissue and fluid analyses. The remaining half of the rats were housed at a density of 4 rats/cage in polycarbonate cages at normal thermal environmental conditions for an additional 10 days to determine if there were any differences in responses between treatments after a recovery period. The remaining rats were examined and sacrificed for body tissue and fluid analyses at the end of the recovery phase. Author (revised)

N94-11191*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EXERCISE COUNTERMEASURES FOR BED-REST DECONDITIONING Final Report, 1986
JOHN GREENLEAF, ed. Jun. 1993 216 p
(Contract RTOP 199-21-12-07)
(NASA-TM-103987; A-93008; NAS 1.15:103987) Avail: CASI HC A10/MF A03

The purpose for this 30-day bed rest study was to investigate the effects of short-term, high intensity isotonic and isokinetic exercise training on maintenance of working capacity (peak oxygen uptake), muscular strength and endurance, and on orthostatic tolerance, posture and gait. Other data were collected on muscle atrophy, bone mineralization and density, endocrine analyses concerning vasoactivity and fluid-electrolyte balance, muscle intermediary metabolism, and on performance and mood of the subjects. It was concluded that: The subjects maintained a relatively stable mood, high morale, and high esprit de corps throughout the study. Performance improved in nearly all tests in almost all the subjects. Isotonic training, as opposed to isokinetic exercise training, was associated more with decreasing levels of psychological tension, concentration, and motivation; and improvement in the quality of sleep. Working capacity (peak oxygen uptake) was maintained during bed rest with isotonic exercise training; it was not maintained with isokinetic or no exercise training. In general, there was no significant decrease in strength or endurance of arm or leg muscles during bed rest, in spite of some reduction in muscle size (atrophy) of some leg muscles. There was no effect of isotonic exercise training on orthostasis, since tilt-table tolerance was reduced similarly in all three groups following bed rest. Bed rest resulted in significant decreases of postural stability and self-selected step length, stride length, and walking velocity, which were not influenced by either exercise training regimen. Most pre-bed rest responses were restored by the fourth day of recovery. Author (revised)

N94-11201*# Sverdrup Technology, Inc., Huntsville, AL.
SPACELAB J AIR FILTER DEBRIS ANALYSIS Interim Report
DONALD C. OBENHUBER Jul. 1993 11 p
(Contract NAS8-37814)
(NASA-CR-192569; NAS 1.26:192569; STS-49-SLJ) Avail: CASI HC A03/MF A01

Filter debris from the Spacelab module SLJ of STS-49 was analyzed for microbial contamination. Debris for cabin and avionics filters was collected by Kennedy Space Center personnel on 1 Oct. 1992, approximately 5 days postflight. The concentration of microorganisms found was similar to previous Spacelab missions averaging 7.4E+4 CFU/mL for avionics filter debris and 4.5E+6 CFU/mL for the cabin filter debris. A similar diversity of bacterial types was found in the two filters. Of the 13 different bacterial types identified from the cabin and avionics samples, 6 were common to both filters. The overall analysis of these samples as compared to those of previous missions shows no significant differences. Author

N94-11548*# Hyperbaric Medicine, San Antonio, TX. Wound Care.
EVALUATION OF MEDICAL TREATMENTS TO INCREASE SURVIVAL OF EBULLISM IN GUINEA PIGS Abstract Only
BARBARA J. STEGMANN, ANDREW A. PILMANIS (Aerospace Medical Research Labs., Brooks AFB, TX.), E. G. WOLF (Aerospace Medical Research Labs., Brooks AFB, TX.), TONIANN DERION (Aerospace Medical Research Labs., Brooks AFB, TX.), J. W. FANTON (Aerospace Medical Research Labs., Brooks AFB, TX.), H. DAVIS (Aerospace Medical Research Labs., Brooks AFB, TX.), G. B. KEMPER (Aerospace Medical Research Labs., Brooks AFB, TX.), and TERRELL E. SCOGGINS (Aerospace Medical Research Labs., Brooks AFB, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 569 Feb. 1993
Avail: CASI HC A01/MF A03

Spaceflight carriers run a constant risk of exposure to vacuum. Above 63,000 ft (47 mmHg), the ambient pressure falls below the vapor pressure of water at 37 C, and tissue vaporization (ebullism) begins. Little is know about appropriate resuscitative protocols after such an ebullism exposure. This study identified injury patterns and mortality rates associated with ebullism while verifying effectiveness of traditional pulmonary resuscitative techniques. Male Hartley guinea pigs were exposed to 87,000 ft for periods of 40 to 115 sec. After descent, those animals that did not breathe spontaneously were given artificial ventilation by bag and mask for up to 15 minutes. Those animals surviving were randomly assigned to one of three treatment groups--hyperbaric oxygen (HBO), ground-level oxygen (GLO2), and ground-level air (GLAIR). The HBO group was treated on a standard treatment table 6A while the GLO2 animals received O2 for an equivalent length of time. Those animals in the GLAIR group were observed only. All surviving animals were humanely sacrified at 48 hours. Inflation of the animal's lungs after the exposure was found to be difficult and, at times, impossible. This may be due to surfactant disruption at the alveolar lining. Electron microscopy identified a disruption of the surfactant layer in animals that did not survive initial exposure. Mortality was found to increase with exposure time: 40 sec--0 percent; 60 sec--6 percent; 70 sec--40 percent; 80 sec--13 percent; 100 sec--38 percent; 110 sec--40 percent, and 115 sec--100 percent. There was no difference in the delayed mortality among the treatment groups (HBO--15 percent, GLO2--11 percent, GLAIR--11 percent). However, since resuscitation was ineffective, the effectiveness of any post-exposure treatment was severely limited. Preliminary results indicate that reuscitation of guinea pigs following ebullism exposure is difficult, and that current techniques (such as traditional CPR) may not be appropriate.
Author (revised)

N94-11556*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FIVE BIOMEDICAL EXPERIMENTS FLOWN IN AN EARTH ORBITING LABORATORY: LESSONS LEARNED FROM DEVELOPING THESE EXPERIMENTS ON THE FIRST INTERNATIONAL MICROGRAVITY MISSION FROM CONCEPT TO LANDING Abstract Only
C. M. WINGET, J. J. LASHBROOK, P. X. CALLAHAN, and R. L. SCHAEFER (Lockheed Engineering and Sciences Co., Moffett Field, CA.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 597 Feb. 1993
Avail: CASI HC A01/MF A03

There are numerous problems associated with accommodating complex biological systems in microgravity in the flexible laboratory systems installed in the Orbiter cargo bay. This presentation will focus upon some of the lessons learned along the way from the University laboratory to the IML-1 Microgravity Laboratory. The First International Microgravity Laboratory (IML-1) mission contained a large number of specimens, including: 72 million nematodes, US-1; 3 billion yeast cells, US-2; 32 million mouse limb-bud cells, US-3; and 540 oat seeds (96 planted), FOTRAN. All five of the experiments had to undergo significant redevelopment effort in order to allow the investigator's ideas and objectives to be accommodated within the constraints of the IML-1 mission. Each of these experiments were proposed as unique entities rather than part of the mission, and many procedures had to be modified from the laboratory practice to meet IML-1 constraints. After a proposal is accepted by NASA for definition, an interactive process is begun between the Principal Investigator and the developer to ensure a maximum science return. The success of the five SLSPO-managed experiments was the result of successful completion of all preflight biological testing and hardware verification finalized at the KSC Life Sciences Support Facility housed in Hangar L. The ESTEC Biorack facility housed three U.S. experiments (US-1, US-2, and US-3). The U.S. Gravitational Plant Physiology Facility housed GTHRES and FOTRAN. The IML-1 mission (launched from KSC on 22 Jan. 1992, and landed at Dryden Flight Research Facility on 30 Jan. 1992) was an outstanding success--close to 100 percent of the prelaunch anticipated science return was achieved and, in some cases, greater than 100 percent was achieved (because of an extra mission day). Author (revised)

N94-11583# Applimath Co., Brookline, MA.
RESEARCH ON ACOUSTIC COUPLING TO ELECTROMAGNETIC PULSES IN TISSUE Final Report, 1 Apr. 1989 - 31 Mar. 1993
HARRY MOSES 15 Apr. 1993 4 p
(Contract F49620-88-C-0070)
(AD-A264764; AFOSR-93-0334TR) Avail: CASI HC A01/MF A01

Over the course of the contract, Dr. Moses published 12 papers, and one is still pending. His work on novel electromagnetic wave propagation, together with insights regarding possible transmitters, is nothing short of terminal. Dr. Moses was the first to rigorously characterize the universal character of far field patterns produced by a source that operated over a finite time frame. Such patterns could be 'requested' and then the design/operating procedure of the source would be the fundamental unknown. Such possibilities were communicated to government lab researchers at AL (Brooks AFB), and subsequent work will be pursued by Dr. Moses, with their help. DTIC

N94-11648 Princeton Univ., NJ. Dept. of Physics.
PROBABILITY OF ALAMETHICIN CONDUCTANCE STATES VARIES WITH NONLAMELLAR TENDENCY OF BILAYER PHOSPHOLIPIDS
S. L. KELLER, A. M. BEZRUKOV, S. M. GRUNER, M. W. TATE, and I. VODYANOY Feb. 1993 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-FG02-87ER-60522; N00014-90-J-1702; N00014-91-F-0201; GM-32614)
(AD-A264957) Avail: CASI HC A03

With few exceptions, membrane lipids are usually regarded as a kind of filler or passive solvent for membrane proteins. Yet, cells exquisitely control membrane composition. Many phospholipids found in plasma membrane bilayers favor packing into inverted hexagonal bulk phases. It was suggested that the strain of forcing such lipids into a bilayer may affect membrane protein function, such as the operation of trans-membrane channels. To investigate this, we have inserted the peptide alamethicin into bilayer membranes composed of lipids of empirically determined inverted hexagonal phase 'spontaneous radii' Ro, which will have expectably different degrees of strain when forced into bilayer form. We observe a correlation between measured Ro and the relative probabilities of different conductance states. States of higher conductance are more probable in Dioleoyl Phosphatidyl Ethanolamine (DOPE), the lipid of highest curvature, 1/Ro, than in Dioleoyl Phosphatidyl Choline (DOPC), the lipid of lowest curvature. DTIC

N94-11667# Los Alamos National Lab., NM.
MOMENTUM INDUCED BY LASER-TISSUE INTERACTION
R. S. DINGUS 1993 14 p Presented at the OE/LASE 1993: International Society for Optical Engineering (SPIE) Conference, Los Angeles, CA, 16-23 Jan. 1993
(Contract W-7405-ENG-36)
(DE93-010737; LA-UR-93-1099; CONF-930159-22) Avail: CASI HC A03/MF A01

Impulsive momentum is imparted to residual tissue during pulsed-laser ablation because the mass ablated is generally ejected with a sizable velocity. Accurate measurements of the impulse are possible, which can provide an important monitor of the ablation process. Simple models can be used to predict the impulse under a variety of conditions; in some cases, complex radiation-hydrodynamic code calculations are required. In this paper, this modeling is discussed along with the dependence of momentum on the pulsed heating and target conditions. Momentum measurement techniques are discussed briefly. The behavior is explained in terms of dimensionless parameters and the impulse coupling coefficient as a function of incident fluence, which has a well defined threshold as well as a maximum. Complications in the mixed liquid-vapor phase are also addressed. DOE

N94-11861# Aerospace Medical Research Labs., Brooks AFB, TX.
EFFECT OF INTERMITTENT COLD EXPOSURE ON THE FIBER-TYPE COMPOSITION OF SELECTED SKELETAL MUSCLES IN RATS Final Technical Report, Mar. - Nov. 1990
THOMAS J. WALTERS and STEFAN H. CONSTABLE Apr. 1993 20 p
(AD-A265309; AL-TR-1992-0099) Avail: CASI HC A03/MF A01

The effect of long-term intermittent cold exposure (CE) on the fiber-type composition of the predominantly type I soleus and the predominantly type IIb extensor digitorum longus (EDL) muscles of the rats was examined. CE was accomplished by submerging the rats in shoulder-deep water, maintained at 20 +/- 0.5 C, for 1 h/d, 5 d/wk, for up to 19 weeks. Rats were randomly assigned to either a Control (CON) or Cold Exposure group. The efficacy of the treatment was tested by subjecting both groups to 20 C water for 45 minutes while measuring rectal temperature (T(sub re)) and VO2. The CE group displayed a 22% smaller reduction in T(sub re) (p less than 0.05) at the end of the exposure, and had a 23% greater VO2 (p less than 0.05) during the same period. Fiber-type composition was determined using routine histochemical methods for myosin-ATPase. The soleus muscle of the CE rats underwent a 156% increase in the number of type IIa fibers (p less than 0.05), with a 24% reduction in type I fibers (p less than 0.05). CE had no significant influence on the fiber-type composition of the EDL muscle. CE resulted in an increase in citrate synthase activity of 20% and 22% in the soleus and EDL muscles, respectively (p less than 0.05). It was demonstrated that intermittent CE induces a type I-to-type IIa transformation in the soleus muscle while having no influence on the EDL muscle. DTIC

N94-11969 Electrotechnical Lab., Ibaraki (Japan). Life Electronics Research Center.
AUTOMATIC CLASSIFICATION SYSTEM FOR ZOOPLANKTON Abstract Only
H. NAKANO and T. SASAKI *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 1 p 436 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

To understand marine ecosystem structure, it is necessary to know marine organism population. Since zooplankton is the secondary producer in the ocean and is a basic link in the food chain, it is important to know the spatial distribution and temporal variation of zooplankton. For this purpose, zooplankton should be collected frequently at various points. Then, these samples should be identified and counted. For rapid processing of many samples, the automatic classification and counting system has been developed. Features, including sizes, extracted from digital images of plankton for classification are used. Geometric features (for example, maximum length, area, and perimeter of plankton) are extracted as numerical values from images of some samples for one taxonomic group of plankton. The geometric features and non-dimensional features constitute the feature vector and it is taken as a specific characteristic of that group. The accuracy of classification to taxonomic groups of zooplankton depends greatly on image processing and the selection of features. Optimum features for classification with the interclass variance and the interclass variance of the features are found. Effective techniques for the classification are selected between the discriminant analysis and the neural network. The developed classification system consists of microscope, TV (Television) camera, magneto-optical disk, image processor, engineering workstation (EWS), and file server with Ethernet. Images are obtained with the TV camera attached to the microscope. They are digitized and processed through binarization. The EWS is used for extraction of features, classification, and counting of zooplankton. Author (NASDA)

N94-12278# Mitsubishi Heavy Industries Ltd., Tokyo (Japan).
COMPATIBILITY TESTS FOR BIOLOGICAL SPECIMENS TO ON-BOARD EXPERIMENTS IN THE SPACE SHUTTLE FLIGHT [SHATORU TOUSAI JIKKENYOU SEIBUTSU SHIRYOU NO TOUSAISEI KAKUNIN SHIKEN]
Tokyo, Japan National Space Development Agency 31 Mar. 1993 22 p In ENGLISH and JAPANESE
(NASDA-CNT-930003; JTN-93-80457) Avail: CASI HC A03/MF A01

A summary of the results of the verification test in accordance with the compatibility verification test requirements for biological specimen to onboard experiment is presented. Studies of the following items were conducted to optimize the electrophoresis conditions, sample concentrations, sample storage conditions, and electrophoresis chamber cleansing methods and to verify that the samples can be carried onboard as electrophoresis experiment samples: (1) keeping microorganism cells; (2) electrophoresis parameter test; (3) optical detection sensitivity of electrophoresis test samples; (4) recovery rate of post-electrophoresis samples; (5) electrophoresis chamber cleansing conditions; and (6) sample stability after electrophoresis. The electrophoresis of Salmonella typhimurium strains, detection of the electrophoresis of Salmonella typhimurium cells, absorbances of the collected fractions, effects of electrophoresis on the visibility of Salmonella typhimurium, efficiency of the bio-cleaning, etc. are shown. Author (NASDA)

N94-12417# Illinois Univ., Urbana. Dept. of Cell and Structural Biology.
THE ORGANIZATION OF THE SUPRACHIASMATIC CIRCADIAN PACEMAKER OF THE RAT AND ITS REGULATION BY NEUROTRANSMITTERS AND MODULATORS Annual Report, 1 Apr. 1990 - 31 Mar. 1993
MARTHA U. GILLETTE, STEVEN J. DEMARCO, JIAN M. DING, EVE A. GALLMAN, and LIA E. FAIMAN 18 May 1993 18 p
(Contract AF-AFOSR-0205-90)
(AD-A266113; AFOSR-93-0423TR) Avail: CASI HC A03/MF A01

The long-term goal of these studies is to understand how cells of the suprachiasmatic nucleus (SCN) are organized to form a 24-h biological clock and what roles specific neurotransmitters and modulators play in timekeeping and resetting processes. We address these questions by assessing the pattern of spontaneous neuronal activity using extracellular and whole cell patch recording techniques in long-lived SCN brain slices from rats. We have observed that a robust pacemaker persists in the ventrolateral region of microdissected SCN and have begun to define the electrophysiological properties of neurons in this region. Further, we are investigating changing sensitivities of the SCN to resetting by exogenous neurotransmitters, such as glutamate, serotonin and neuropeptide Y, across the circadian cycle. Our findings emphasize the complexity of organization and control of mammalian circadian timing. DTIC

N94-12441# Hahnemann Medical Coll. and Hospital, Philadelphia, PA. Dept. of Mental Health Sciences.
LOCUS COERULEUS, VIGILANCE, AND STRESS: BRAIN MECHANISMS OF ADAPTIVE BEHAVIORAL RESPONSIVENESS Final Technical Report, 15 Dec. 1989 - 31 Dec. 1992
GARY A. JONES 13 May 1993 48 p
(Contract AF-AFOSR-0147-90)
(AD-A265657; AFOSR-93-0399TR) Avail: CASI HC A03/MF A01

We have developed techniques for recording stable unit activity from individual monkey locus coeruleus (LC) neurons using microwire electrodes (25 micrometers diameter). A combination of improved electrode design, new microadvancer, and methods to accurately localize the LC nucleus now permits stable recordings of high signal/noise (better than 3/1) from single neurons in the LC for several hours in the waking monkey performing a vigilance task. We have found that LC neurons vary activity phasically and tonically during vigilance performance. Phasic responses are selectively evoked by target cues, and follow new targets during acquisition of reversal in this task. Tonically, LC neurons vary activity levels in accordance with attentiveness to the task, as measured by the frequency of foveating a fix spot required to initiate each trial. Results indicate that the LC functions to regulate the lability of attention. In this view, performance on a task requiring focused attention varies with tonic LC activity in an inverted U relationship. Too little LC activity is associated with poor performance due to non-alertness, while high tonic LC activity corresponds to highly labile attention that prevents focusing attention for long time epochs. Together, these results indicate that optimal vigilance performance (e.g., radar monitoring activity) may require an intermediate level of LC activity and high phasic responsiveness of LC neurons. DTIC

N94-12559*# Wisconsin Univ., Madison. Dept. of Soil Science.
PLANT ARCHITECTURE, GROWTH AND RADIATIVE TRANSFER FOR TERRESTRIAL AND SPACE ENVIRONMENTS Final Report, 1 Feb. 1989 - 31 Jan. 1993
JOHN M. NORMAN and NARENDRA S. GOEL (State Univ. of New York, Binghamton.) 1993 9 p
(Contract NAGW-1575)
(NASA-CR-193476; NAS 1.26:193476) Avail: CASI HC A02/MF A01

The overall objective of this research was to develop a hardware implemented model that would incorporate realistic and dynamic descriptions of canopy architecture in physiologically based models of plant growth and functioning, with an emphasis on radiative transfer while accommodating other environmental constraints. The general approach has five parts: a realistic mathematical treatment of canopy architecture, a methodology for combining this general canopy architectural description with a general radiative transfer model, the inclusion of physiological and environmental aspects of plant growth, inclusion of plant phenology, and integration. Author (revised)

N94-12656 National Inst. for Resources and Environment, Ibaraki (Japan).
THE SEASONAL CHANGE OF PHYTOPLANKTON SIZE DISTRIBUTION USING OPTICAL FIBER SENSOR
KISABUROU NAKATA, FUMIO HORIGUCHI, and TOORU NAKANE (Biological Research Inst., Ibaraki, Japan.) *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 669-676 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

Phytoplankton size spectrum in Hunka Bay is measured using an optical fiber sensor developed by Kakui et al. The time variation of size spectra throughout a year is also presented. The major feature is that the phytoplankton that are 40-45 micrometers in diameter dominate in the spring bloom, which corresponds to chain form Chaetoceros. In other seasons, remarkable phytoplankton does not appear. With regard to zooplankton, the microzooplankton population peak coincides with the phytoplankton blooming period, while net zooplankton population grow after the termination of spring bloom. Author (NASDA)

N94-12660 Nagoya Univ. (Japan). Water Research Inst.
THE PHYTOPLANKTON BLOOM IN THE KINU-URA BAY, JAPAN IN THE RAINY SEASON
JUNKO HAMA and NOBUHIKO HANDA *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 692-697 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

Biomass, chemical composition, and production rate of phytoplankton populations are studied at Kinu-ura Bay, Japan, which is semi-closed eutrophic bay. The study took place during the rainy season from late May to early July in 1983, at intervals from one to five days. Considerable amounts of nutrients were frequently supplied from rivers into the surface layer of the bay in the experimental period. These appeared to be a major direct nutrient source for phytoplankton blooms in this season. Renewal of water mass with frequent river influx largely affected occurrence and disappearance of phytoplankton bloom. The protein/carbohydrate ratio of particulate matter at the surface layer was generally greater than or equal to three, which indicated high growth activities of phytoplankton populations at the surface layer throughout this period. Mean and total production rate for the experimental period were about 2 and 90 gC(m sup -2)(d sup -1), respectively. The importance of the production in the rainy season to an annual production is suggested by this study.
Author (NASDA)

N94-12661 Nagoya Univ. (Japan). Water Research Inst.
VARIATION OF THE PHOTOSYNTHETIC PRODUCTS IN THE REGIONAL UPWELLING AREA AROUND THE IZU ISLANDS, JAPAN
TAKEO HAMA *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 698-703 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

This study is carried out to assess the relation between the photosynthetic products and nutrient availability of the phytoplankton population. A combined C-13 tracer and Gas Chromatography-Mass Spectrometry (GC-MS) method was applied to determine the composition of photosynthetic products inside and outside of regional upwelling waters around the Izu Islands, Japan. This method can measure the monosaccharide and amino acid composition of carbohydrate and protein/amino acid of photosynthetic products, respectively. Production rate of protein/amino acid (sum of the production rates of 12 amino acids) was highest in the nutrient-rich 'maturing' upwelling water, where higher concentrations of nutrients were measured than in the non-upwelling and nutrient-depleted 'aged' upwelling waters. Production rate of carbohydrate (sum of the production rates of eight monosaccharides), on the other hand, showed the highest value in the 'aged' upwelling water and this was exclusively due to the high production rate of glucose; the production rate of glucose accounted for 90 percent of the total carbohydrate production, whereas glucose accounted for 50 percent in 'maturing' upwelling water. These results demonstrated that composition of photosynthetic products significantly varied through the 'aging' of upwelling, probably due to the change in the nutrient availability.
Author (NASDA)

N94-12699 Tokyo Univ. (Japan). Ocean Research Inst.
ACOUSTIC ESTIMATION OF PLANKTON BIOMASS
TADASHI INAGAKI, ICHIROU AOKI, and TAKEO ISHII *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 916-921 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

The around-the-world cruise of R/V (Research Vessel) Hakuho-maru was performed by Ocean Research Institute, University of Tokyo during 130 days. Acoustic measurements at four frequencies with small organisms sampling were carried out 43 times at 19 stations. The biomass represented by settling volume was compared with acoustic volume scattering strength (SV in decibels) at each frequency. The relationship between biomass (transformed into logarithm) and SV was obtained as linear regression equations. Slopes of the regression equations for four frequencies were all close to one. There was a decreasing tendency of SV with increasing frequency. This result suggests that resonance phenomenon occurs in scattering process of the small organisms. Author (NASDA)

N94-12726 Academy of Sciences (USSR), Saint Petersburg. Inst. of Oceanology.
OPTIMUM SELECTION OF SPECTRAL CHANNELS IN THE PROBLEM OF REMOTE SENSING OF PHYTOPLANKTON CONCENTRATION IN OCEAN WATER
V. P. KOZLOV, J. M. LEVIN, and L. V. ZOLOTUKHIN *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 1073-1074 25 Aug. 1992
Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

A new method is proposed to estimate phytoplankton (chlorophyll) concentration in ocean water at the maximum accuracy by measurements of the upwelling radiation spectra conducted by a ship or satellite. The method is based on the results of the mathematical theory of experimental design. The accuracy can be strongly increased by optimum selection of spectral channels for the measurements. A convergent iterative algorithm is proposed for searching for optimum channels and corresponding time intervals. The algorithm is realized as a routine in the PASCAL language. The input data for this algorithm are correlation characteristics of the system: spectrum of upwelling radiation to chlorophyll concentration (C). Increasing the number of both joint and separate measurements of the upwell radiation and C from a ship and satellite will make it possible to improve the accuracy of defining optimum spectral channels and consequently accuracy of the C estimate. The method of statistical simulation can also be used to determine the correlation characteristics needed for searching for optimum channels.
Author (NASDA)

N94-12758 Academy of Sciences (USSR), Vladivostok. Pacific Research Inst. of Fisheries and Oceanography.
HIGH BIOLOGICAL PRODUCTION OF THE TIDAL MIXING ZONES ON JAPAN SEA SHELF
YURY I. ZUENKO *In* Scientific Organizing Committee of PORSEC, Proceedings of the PORSEC 1992 in Okinawa: Conference for Pacific Ocean Environments and Probing, Volume 2 p 1240-1244 25 Aug. 1992

Copyright Avail: Issuing Activity (Scientific Organizing Committee of PORSEC, P.O. Box 10, Shimizu, Shizuoka 424, Japan, HC)

The seasonal variation of summary plankton production is considered according to the observational data from summer-autumn 1989-1990 in the northwestern part of the Sea of Japan. In stratificated offshore waters, the low productivity (P/B (Daily Production per a Unit of Biomass) 0.2 d(exp -1)) was observed in July-August. It grew in September, especially in October (to 1 to 3 d(exp -1)). In the tidal mixing zones on shelf with weakened stratification, the period of low productivity was shorter: from the middle of July to the middle of August. The reason for these peculiar tidal mixed zones is an uninterrupted nutrient influx to the euphotic layer, that becomes weak in the time of the highest heating only. Everywhere in the north-western part of the sea, the autumn bloom of phytoplankton begins in September, owing to a wind-wave stirring, with addition of an upwelling effect near the Prymorye Coast in October-November. When the plankton production is low offshore but still (or already) high in the tidal mixing zones, plankton-eating fishes (such as sardine) concentrate in this zone on the shelf. Author (NASDA)

N94-12793*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CATALYSIS AND BIOCATALYSIS PROGRAM Final Report, May 1980 - 31 Dec. 1991
J. D. INGHAM 1 May 1993 68 p
(Contract DE-AI01-86CE-90239)
(NASA-CR-194105; JPL-PUBL-93-04; NAS 1.26:194105) Avail: CASI HC A04/MF A01

This final report presents a summary of research activities and accomplishments for the Catalysis and Biocatalysis Program, which was renamed the Biological and Chemical Technologies Research (BCTR) Program, currently of the Advanced Industrial Concepts Division (AICD), Office of Industrial Technologies of the Department of Energy (DOE). The Program was formerly under the Division of Energy Conversion and Utilization Technologies (ECUT) until the DOE reorganization in April, 1990. The goals of the BCTR Program are consistent with the initial ECUT goals, but represent an increased effort toward advances in chemical and biological technology transfer. In addition, the transition reflects a need for the BCTR Program to assume a greater R&D role in chemical catalysis as well as a need to position itself for a more encompassing involvement in a broader range of biological and chemical technology research. The mission of the AICD is to create a balanced Program of high risk, long-term, directed interdisciplinary research and development that will improve energy efficiency and enhance fuel flexibility in the industrial sector. Under AICD, the DOE Catalysis and Biocatalysis Program sponsors research and development in furthering industrial biotechnology applications and promotes the integrated participation of universities, industrial companies, and government research laboratories.
Author (revised)

N94-12795*# Texas Univ., San Antonio.
MONOCLONAL ANTIBODIES DIRECTED AGAINST SURFACE MOLECULES OF MULTICELL SPHEROIDS Semiannual Status Report, 1 Jan. - 30 Jun. 1993
ANDREW O. MARTINEZ 1993 10 p
(Contract NAG2-819)
(NASA-CR-193560; NAS 1.26:193560) Avail: CASI HC A02/MF A01

The objective of this project is to generate a library of monoclonal antibodies (MAb's) to surface molecules involved in the cell-cell interactions of mammalian cells grown as multicell spheroids (MCS). MCS are highly organized 3-dimensional multicellular structures which exhibit many characteristics in vivo tissues not found in conventional monolayer or suspension culture. They also provide a functional assay for surface adhesion molecules. In brief, MCS combine the relevance of organized tissues with the accuracy of in vitro methodology. Further, one can manipulate these MCS experimentally to discern important information about their biology. Author (revised)

N94-12835# Pennsylvania State Univ., University Park. Dept. of Biology.
ROLE OF CA(++)/CALMODULIN IN THE REGULATION OF MICROTUBULES IN HIGHER PLANTS
R. CYR 1992 7 p
(Contract DE-FG02-91ER-20050)
(DE93-015885; DOE/ER-20050/T1) Avail: CASI HC A02/MF A01

The cytoskeleton including its microtubule (Mt) component participates in processes that directly affect growth and development in higher plants. Normal cytoskeletal function requires the precise and orderly arrangement of Mts into several cell cycle and developmentally specific arrays. The cortical array somehow directs the deposition of cellulose. Little molecular information is available regarding the formation of these arrays or the cellular signals to which they respond. Experimental data described here suggests that plant cells use calcium, in the form of a Ca(sup ++)/calmodulin complex, to affect the dynamics of Mts within the cortical array. Owing to the importance of Ca(sup ++) as a regulatory ion in higher plants we are probing for a putative Ca(sup ++)/Mt transduction pathway which may serve to integrate Mt activities within the growing and developing plant cell. We are using a lysed cell model in conjunction with immunocytochemical and biochemical methodologies to dissect how Ca(sup ++)/calmodulin interacts with Mts to affect their function. DOE

N94-13210*# Scripps Institution of Oceanography, La Jolla, CA.
EVOLUTION OF CATALYTIC RNA IN THE LABORATORY Final Technical Report, 1 Apr. 1989 - 31 Mar. 1992
GERALD F. JOYCE 31 Mar. 1992 7 p
(Contract NAGW-1671)
(NASA-CR-194124; NAS 1.26:194124) Avail: CASI HC A02/MF A01

We are interested in the biochemistry of existing RNA enzymes and in the development of RNA enzymes with novel catalytic function. The focal point of our research program has been the design and operation of a laboratory system for the controlled evolution of catalytic RNA. This system serves as working model of RNA-based life and can be used to explore the catalytic potential of RNA. Evolution requires the integration of three chemical processes: amplification, mutation, and selection. Amplification results in additional copies of the genetic material. Mutation operates at the level of genotype to introduce variability, this variability in turn being expressed as a range of phenotypes. Selection operates at the level of phenotype to reduce variability by excluding those individuals that do not conform to the prevailing fitness criteria. These three processes must be linked so that only the selected individuals are amplified, subject to mutational error, to produce a progeny distribution of mutant individuals. We devised techniques for the amplification, mutation, and selection of catalytic RNA, all of which can be performed rapidly in vitro within a single reaction vessel. We integrated these techniques in such a way that they can be performed iteratively and routinely. This allowed us to conduct evolution experiments in response to artificially-imposed selection constraints. Our objective was to develop novel RNA enzymes by altering the selection constraints in a controlled manner. In this way we were able to expand the catalytic repertoire of RNA. Our long-range objective is to develop an RNA enzyme with RNA replicase activity. If such an enzyme had the ability to produce additional copies of itself, then RNA evolution would operate autonomously and the origin of life will have been realized in the laboratory. Derived from text

N94-13447*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CLINICAL PHYSIOLOGY OF BED REST
JOHN E. GREENLEAF Apr. 1993 27 p
(Contract RTOP 199-18-12-07)
(NASA-TM-104010; A-93058; NAS 1.15:104010) Avail: CASI HC A03/MF A01

Maintenance of optimal health in humans requires the proper balance between exercise, rest, and sleep as well as time in the upright position. About one-third of a lifetime is spent sleeping;

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and it is no coincidence that sleeping is performed in the horizontal position, the position in which gravitational influence on the body is minimal. Although enforced bed rest is necessary for the treatment of some ailments, in some cases it has probably been used unwisely. In addition to the lower hydrostatic pressure with the normally dependent regions of the cardiovascular system, body fluid compartments during bed rest in the horizontal body position, and virtual elimination of compression on the long bones of the skeletal system during bed rest (hypogravia), there is often reduction in energy metabolism due to the relative confinement (hypodynamia) and alteration of ambulatory circadian variations in metabolism, body temperature, and many hormonal systems. If patients are also moved to unfamiliar surroundings, they probably experience some feelings of anxiety and some sociopsychological problems. Adaptive physiological responses during bed rest are normal for that environment. They are attempts by the body to reduce unnecessary energy expenditure, to optimize its function, and to enhance its survival potential. Many of the deconditioning responses begin within the first day or two of bed rest; these early responses have prompted physicians to insist upon early resumption of the upright posture and ambulation of bedridden patients. Author

N94-13473*# East Carolina Univ., Greenville, NC. School of Medicine.

PHYSIOLOGICAL ANATOMICAL RODENT EXPERIMENT (PARE) .04 FEASIBILITY TEST 1

HUBERT W. BURDEN 22 Sep. 1993 73 p

(Contract NCC2-810)

(NASA-CR-194423; NAS 1.26:194423) Avail: CASI HC A04/MF A01

The objective of this feasibility study was to investigate the environmental/treatment stresses in the proposed PARE.04 experiments in a ground based study to determine if these stresses were of sufficient magnitude to compromise the planned shuttle experiments. Eighty pregnant Sprague-Dawley rats were received on day 2 (day I equals day of vaginal plug) of gestation (G2) and on G7 60 were laparotomized to determine the condition of pregnancy and allow assignment to test groups. The five test groups (N equals 10 each group) were as follows: Group 1, nominal flight; Group 2, laparotomy control; Group 3, hysterectomy control; Group 4, vivarium control; Group 5, caesarean delivery. On G17, groups 1, 2, and 5 were subjected to unilateral hysterectomy to obtain fetuses for evaluation. There was no difference in fetal crown-rump length, fetal weight, or placental weight in any of the test groups subjected to unilateral hysterectomy at G17. Animals were allowed to go to term and animals in each group delivered between the morning of G22 and the afternoon of G23. Rats assigned to Group 5 began delivering vaginally prior to the designated time for caesarean section, thus only 2 animals in this group were delivered by caesarean section. After delivery, a blood sample was taken from the dam, and they were euthanized and the thymus and adrenal glands weighed. Pups from experimental dams were tattooed for identification, the anogenital distance of male pups was photographed for later measurement, and all pups placed with foster dams and litter sizes were standardized to 10. On day 7, all pups were euthanized, and pup adrenal glands and thymus weighed. Laparotomy at G7 with or without unilateral hysterectomy at G17, had no effect on pregnancy maintenance or vaginal delivery. There was no difference in maternal adrenal or thymus weights or plasma levels of catecholamines, estradiol, progesterone, or corticosterone. Likewise, there was no difference in the anogenital distance (index of fetal stress) of neonatal male pups, between any of the experimental groups. From days 0-7, weight gain from dams in all experimental groups was similar. Lastly, there was no difference in weights of thymus and adrenal glands in pups euthanized at day 7. Collectively, these data indicate that treatment stresses inherent in the proposed PARE.04 experimental design should not compromise the planned shuttle experiments. Author (revised)

N94-13562*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

THE EVOLUTION OF ENERGY-TRANSDUCING SYSTEMS: STUDIES WITH ARCHAEBACTERIA Semiannual Progress Report, Mar. - Aug. 1993

HELGA STAN-LOTTER Aug. 1993 5 p

(Contract NCC2-578)

(NASA-CR-194130; NAS 1.26:194130) Avail: CASI HC A01/MF A01

N-ethylmaleimide (NEM) inhibits the ATPase of H. saccharovorum in a nucleotide protectable manner. The bulk of 14C-NEM is incorporated into subunit 1. Inhibition kinetics indicated a single binding site. To determine the sequence around this site, cyanogen bromide peptides of NEM-labeled ATPase enzyme were prepared and separated on Tris-Tricine gels. Autoradiography indicated that the NEM binding site is probably located in a fragment of Mr 10-12 K. This result will be confirmed by N-terminal sequencing of the peptide. Since the cysteinyl residue, to which NEM is bound, may be located at the C-terminal end, purification and proteolytic treatment of the 10 K peptide will be required. One inhibitor of V-type ATPases, fluoresceinisothiocyanate (FITC) inhibited also the ATPase of H. saccharovorum. Preliminary results indicated protection against inhibition by nucleotides. Localization of the binding sited to the major subunits is in progress. An extraction procedure for the membrane sector of the ATPase complex of H. saccharovorum yielded a preparation which was enriched in a peptide of Mr 5 500. Experiments to test the immunological crossreaction with subunit c from the Escherichia coli F-type ATPase and the labeling with 14C-DCCD are currently carried out. Polyclonal antiserum to the smaller of the major subunits of the ATPase from H. saccharovorum (subunit II) reacts in Western blots strongly with the alpha and beta subunits of the F1 ATPase of E. coli, suggesting highly conserved regions on both types of ATPases. To elucidate further the regions of homology, cyanogen bromide peptides of the beta subunits were prepared for sequence analysis. Derived from text

N94-13698# Gordon Research Conferences, Inc., Kingston, RI.

GORDON RESEARCH CONFERENCE ON CHRONOBIOLOGY, 1991 Final Report, 1 Aug. 1991 - 31 Jul. 1992

J. W. HASTINGS 31 Jul. 1992 9 p Conference held in Irsee, Germany, 29 Sep. - 4 Oct. 1991

(Contract AF-AFOSR-0280-91)

(AD-A266354; AFOSR-93-0447TR) Avail: CASI HC A02/MF A01

The 1991 Gordon Conference on Chronobiology was held at the Swabian Conference Center in Irsee, Germany, from 29 Sep. - 4 Oct. 1991. The possibility of holding the conference in Europe was known at the previous (1989) meeting, and conferees voted to do so if the opportunity materialized. Probably more than most, the field of chronobiology embraces many subdisciplines, ranging from molecular biology and genetics to physiology and ecology. It is also diverse in terms of biological material, including all Kingdoms and spanning the phylogenetic spectrum. It is relevant to many specific missions, such as medicine and pharmacology, agriculture, and insect control, as well as marine biology and oceanography. The program thus reflects the wish and the willingness of workers in this area to consider a diversity of functions and a diversity of systems, ranging from nitrogen fixation in bacteria, photosynthesis and luminescence in marine dinoflagellates and CAB gene expression in wheat, to conidiation in Neurospora, eclosion in Drosophila, and activity in rodents and man. DTIC

N94-13760*# Osaka Univ. (Japan). Medical School.

SEPARATION OF BIOGENIC MATERIALS BY ELECTROPHORESIS UNDER ZERO GRAVITY (L-3)

MASAO KURODA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 155-160 Aug. 1993

Avail: CASI HC A02/MF A03

Electrophoresis separates electrically charged materials by imposing a voltage between electrodes. Though free-flow electrophoresis is used without carriers such as colloids to separate and purify biogenic materials including biogenic cells and proteins in blood, its resolving power and separation efficiency is very low

on Earth due to sedimentation, flotation, and thermal convection caused by the specific gravity differences between separated materials and buffer solutions. The objective of this experiment is to make a comparative study of various electrophoresis conditions on the ground and in zero-gravity in order to ultimately develop a method for separating various important 'vial' components which are difficult to separate on the ground. Author (revised)

N94-13763*# Tokyo Medical and Dental Univ. (Japan).
STUDIES ON THE EFFECTS OF MICROGRAVITY ON THE ULTRASTRUCTURE AND FUNCTIONS OF CULTURED MAMMALIAN CELLS (L-6)
ATSUSHIGE SATO *In* NASA, Marshall Space Flight Center, Spacelab J Experiment Descriptions p 171-172 Aug. 1993
Avail: CASI HC A01/MF A03

The human body consists of 10(exp 13) cells. Understanding the mechanisms by which the cells sense and respond to microgravity is very important as the basis for space biology. The cells were originally isolated aseptically from mammalian bodies and cultured in vitro. A set of cell culture vessels was developed to be applied to three kinds of space flight experiments. Experiment 1 is to practice the cell culture technique in a space laboratory and obtain favorable growth of the cells. Aseptic handling in tryspin treatment and medium renewal will be tested. The cells, following space flight, will be returned to the ground and cultured continuously to investigate the effects of space flight on the cellular characteristics. Experiment 2 is to examine the cytoskeletal structure of the cells under microgravity conditions. The cytoskeletal structure plays essential roles in the morphological construction, movements, axonal transport, and differentiation of the cells. The cells fixed during space flight will be returned and the cytoskeleton and ultrastructure observed using electron microscopy and fluorescence microscopy. Experiment 3 is to study the cellular productivity of valuable substances. The waste medium harvested during space flight are returned and quantitated for the cellular products. The effects of microgravity on mammalian cells will be clarified from the various aspects. Author (revised)

N94-13764*# State Univ. of New York, Stony Brook.
GRAVITY, CHROMOSOMES, AND ORGANIZED DEVELOPMENT IN ASEPTICALLY CULTURED PLANT CELLS
ABRAHAM D. KRIKORIAN *In* NASA, Marshall Space Flight Center, Spacelab J Experiment Descriptions p 173-176 Aug. 1993
Avail: CASI HC A01/MF A03

The objectives of the PCR experiment are, to test the hypothesis that microgravity will in fact affect the pattern and developmental progression of embryogenically competent plant cells from one well-defined, critical stage to another; to determine the effects of microgravity in growth and differentiation of embryogenic carrot cells grown in cell culture; to determine whether microgravity or the space environment fosters an instability of the differentiated state; and to determine whether mitosis and chromosome behavior are adversely affected by microgravity. The methods employed will consist of the following: special embryogenically competent carrot cell cultures will be grown in cell culture chambers provided by NASDA; four cell culture chambers will be used to grow cells in liquid medium; two dishes (plant cell culture dishes) will be used to grow cells on a semi-solid agar support; progression to later embryonic stages will be induced in space via crew intervention and by media manipulation in the case of liquid grown cell cultures; progression to later stages in case of semi-solid cultures will not need crew intervention; embryo stages will be fixed at a specific interval (day 6) in flight only in the case of liquid-grown cultures; and some living cells and somatic embryos will be returned for continued post-flight development and 'grown-out.' These will derive from the semi-solid grown cultures. Author (revised)

N94-13766*# Kyoto Univ. (Japan). Radiation Biology Center.
GENETIC EFFECTS OF HZE AND COSMIC RADIATION (L-9)
MITUO IKENAGA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 181-184 Aug. 1993
Avail: CASI HC A01/MF A03

The purpose of our experiment is to detect mutations in Drosophila possibly induced by space radiation during the SL-J mission, so that we will be able to obtain basic information about 'the genetic (mutational) risk of space radiation' which can be used to estimate human risk of cancer induction by space flight. As an example of somatic mutation, we will analyze morphological changes in hair growing on the surface of the wing of an adult fly. A piece of wing consists of about 30 thousand wing cells and in the wild type Drosophila a long single piece of hair is growing on the surface of each wing cell. When Drosophila is exposed to radiation as its early stage of development, such as embryonic stage or larval (maggot) stage, some mutations will appear in the wing hair of the adult fly with a certain low frequency, depending on the radiation dose. Among the mutations, the most frequent one is a change in the number of hairs per cell, that is, usually three or more hairs are coming out from a single wing cell. In the actual SL-J flight, we will install thousands of Drosophila larvae (maggots) into the Space Shuttle Discovery and expose them to space radiation during the 7-day mission. Immediately after the re-entry to the ground, these larvae are expected to develop (emerge) into adult flies. Then the wings will be fixed by ethylalcohol and permanent samples will be prepared. Finally, we will analyze the wing samples microscopically in order to detect mutations. Author (revised)

N94-13769*# Shizuoka Univ. (Japan).
A CIRCADIAN RHYTHM OF CONIDIATION IN NEUROSPORA CRASSA (L-12)
YASHUHIRO MIYOSHI *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 197-200 Aug. 1993
Avail: CASI HC A01/MF A03

Two fungi growth chambers containing six growth tubes each are used in this experiment. One chamber is for the space experiment; the other is for the simultaneous ground control experiment. The hyphae of Neurospora crassa band A mutant are inoculated at one end of each tube. Both the chambers are kept at 3 C plus or minus 1.5 C to stop hyphae growth until the Spacelab is activated. After the activation, each chamber is transferred simultaneously to the Spacelab and a phytotron in KSC and kept in continuous light at the same temperature. After about 24 hours of light exposure, each chamber is inserted into a growth chamber bag to keep it in constant darkness. The circadian rhythm of conidiation is initiated by this light to dark transition. After the dark incubation for 5 days at room temperature, both the growth chambers are kept at 3 C plus or minus 1.5 C to stop growth of the hyphae. After the space shuttle lands, both conidiation patterns are compared and analyzed. It has been known that numerous physiological phenomena show circadian rhythms. They are characterized by the fact that the oscillation can persist under constant conditions of light and temperature. Therefore, it has been accepted by most investigators that the generation mechanism of the circadian rhythm is endogeneous. However, one cannot reject the possibility that these rhythms are caused by some geophysical exogeneous factor having a 24-hour period, such as atmospheric pressure, gravity, or electromagnetic radiation. We use Neurospora crassa band A mutual which shows an obvious circadian rhythm in its spore-forming (conidiation) on the ground, and we intend to attempt the conidation of this mutant in the Spacelab where 24-hour periodicity is severely attenuated and to elucidate the effect of the geophysical exogeneous factor in the generation mechanism of the circadian rhythm. Author (revised)

N94-13770*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AMPHIBIAN FERTILIZATION AND DEVELOPMENT IN MICROGRAVITY
KENNETH A. SOUZA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 201-207 Aug. 1993
Avail: CASI HC A02/MF A03

During the year before launch, female frogs will be tested every 3 months for the quantity and quality of eggs produced. Two weeks or more prior to launch, male and female frogs will be transported to the John F. Kennedy Space Center (KSC). During

the few weeks before launch, groups will be periodically tested for egg quality to assure that the frogs have adapted to the KSC laboratory environment. About 27 hours before launch, four females will be placed in a damp foam-lined box, called the Adult Frog Box (AFB), through which 100 cc/min of air wil be circulated. The AFB will be lowered into the Spacelab and loaded into the Frog Environmental Unit (FEU) during the final pre-launch preparations. A sperm suspension, for use in flight to fertilize the eggs, will also be prepared and loaded during the pre-launch period. The sperm suspension, together with a kit of syringes containing Human Chorionic Gonadotropin (HCG), will be stored in a refrigerator aboard the shuttle until needed in flight. On the first day of flight, the AFB will be transferred from the FEU to the General Purpose Work Station (GPWS), which is a type of glove box specially designed to allow the crew to use chemicals and biological materials during the flight without contaminating the shuttle/Spacelab environment. Inside the GPWS the four adult frogs will be injected with the HCG hormone and returned to the FEU. Approximately 16 hours after injection, ovulation should have taken place and 15 to 20 eggs from each frog will be placed on each of two egg baskets and covered with sperm for 10 minutes. The egg baskets are inserted into acrylic egg chambers and 50 ml of 'pond water' (20 percent strength Modified Ringers solution (is added. One of the chambers from each frog will be placed on a centrifuge within the FEU and rotated to simulate normal terrestrial gravity (1 g). The remaining chambers are incubated under microgravity conditions within the FEU. Forty minutes after fertilization, the four chambers exposed to 1 g will be removed and observed within the GPWS using a dissecting microscope and camera system. On the basis of egg rotation and egg appearance, the 'best' and 'second best' frogs will be selected to contribute additional eggs. Using the two best frogs, 22 egg chambers will be loaded with eggs and fertilized. Eleven chambers wil be incubated at microgravity and eleven will be incubated on the centrifuge. At various times during the flight, chambers will be removed from the FEU and transferred to the GPWS where a formaldehyde-based fixative will be injected in order to preserve important developmental stages for in depth study following the flight. Five of the 22 chambers plus the eight fertilization test chambers will be returned to Earth with live tadpoles. The swimming behavior of these free swimming tadpoles will be examined within several hours of landing and some will be fixed for a detailed analysis of their inner ear, the otolity, the animals 'balance system.' Lychakov and Vinikov reported an increase in otolith size in tadpoles that developed (but were not fertilized) in space. Live tadpoles from the SL-J flight will be raised through metamorphsis for studies of maturation including an analysis of the effects of space flight on their ability to produce normal progency. Following the flight, the fixed embryos will be serially sectioned and stained using procedures that were developed for this experiment. The embroys fixed at the 2-4 cell stage will be examined for the distribution of cytoplasmic contents, including the various classes of yolk platelets, and the location and shape of the cleavage furrows. The gastrulae will be assessed for the normality of the complex cellular rearrangements that constitute blastopore formation and involution, i.e., the differentiation of the embryo into its specialized body parts. Using a new procedure, the gastrulae will be bleached which will enable the initial sperm entry point (SEP) to be located. The correlation between the SEP and the dorsal lip of the blastopore will be determined. Under normal terrestrial conditions it was shown that the SEP typically is located on the side of the egg opposite the future dorsal side of the embryo. The neurulae will be examined for the normality and completeness of the neural plate and archenteron expansion. The tadpole stages will be used to study the allometry and morphology of the various organ systems. Author (revised)

N94-13823 Alberta Univ., Edmonton. Dept. of Zoology.
IMPROVING PHYSICAL PERFORMANCE BY CHEMICAL STIMULATION Final Report
LAWRENCE C. H. WANG 22 May 1992 34 p
(DSIS-92-03763; CTN-93-60770) Avail: CASI HC A03

The effectiveness of ginseng saponin (GS) as an ergogenic agent was evaluated and the mechanisms through which GS elicits its beneficial effect on exercise performance were elucidated. Short term (2-4 days) pretreatment with GS significantly prolonged the aerobic endurance of mature young and old rats exercising at 70 percent maximum oxygen volume. Results indicated that either a proto-panaxadiol triterpenoid or a proto-panaxatriol triterpenoid purified from GS were essential for eliciting the beneficial ergogenic effects of GS. Compared to saline treated control rats, GS significantly increased the plasma free fatty acid level of the animals at rest and during exercise. During exercise, the plasma glucose level of the control group declined progressively, whereas in the GS-treated animals it maintained a stable level. Both the liver and skeletal muscle glycogen levels of the GS-treated rats were slightly higher than those of the control animals after exhaustive exercise. These results indicate that GS enhances exercise endurance by altering fuel homeostasis during prolonged exercise, presumably by increasing free fatty acid utilization in preference of glucose for cellular energy production. Author (CISTI)

N94-13865*# Georgia State Univ., Atlanta. Language Research Center.
SELECTION OF BEHAVIORAL TASKS AND DEVELOPMENT OF SOFTWARE FOR EVALUATION OF RHESUS MONKEY BEHAVIOR DURING SPACEFLIGHT Semiannual Status Report, Mar. - Aug. 1993
DUANE M. RUMBAUGH and DAVID A. WASHBURN Aug. 1993 7 p
(Contract NAG2-438)
(NASA-CR-194176; NAS 1.26:194176) Avail: CASI HC A02/MF A01

The results of several experiments were disseminated professionally during this semiannual period. These peer-reviewed papers that were accepted for publication represent the growth of our research areas, as follow-up experiments to previously published work in cognition and enrichment have been completed and are being published. The presentations not only reflect the latest interesting results that we have obtained, but also serve as a testament to the intense interest that is being expressed for our test system and findings. Derived from text

N94-14028*# Krug Life Sciences, Inc., Houston, TX.
METABOLIC RATE MEASUREMENTS COMPARING SUPINE WITH UPRIGHT UPPER-BODY EXERCISES
SUZANNE M. FORTNEY, MICHAEL C. GREENISEN, KARIN C. LOFTIN, DONYA BEENE, SONDRA FREEMAN-PEREZ, and LINDA HNATT Sep. 1993 22 p
(Contract NAS9-18492)
(NASA-CR-4549; S-736; NAS 1.26:4549) Avail: CASI HC A03/MF A01

The ground-based study that tested the hypothesis that metabolic rates during supine and upright upper-body exercises are similar (mean value of 200 kcal/h) is presented. Six subjects each performed supine or upright exercise at three exercise stations, a hand-cycle ergometer, a rope-pull device, and a torque wrench. After a baseline measurement of the metabolic rate at rest, the metabolic rate was measured twice at each exercise station. The mean metabolic rates (kcal/h) during supine ($n = 6$) and upright control ($n = 4$) exercise stations were not significantly different except for the rope-pull station, 153.5 +/- 16.6 (supine) as compared to 247.0 +/- 21.7 (upright), p is less than 0.05. This difference may be due in part to an increased mechanical efficiency of supine exercises (15.0 +/- 0.7 percent) as compared to that of upright exercises (11.0 +/- 1.08 percent), p is less than 0.05. The net energy input was significantly smaller for the supine rope-pull exercise (64 +/- 18) as compared to upright (176 +/- 20). The relationship between best-rest exercises, metabolic rates, and the incidence of decompression sickness (DCS) should be examined to determine the true risk of DCS in spaceflight extravehicular activities. Author (revised)

N94-14032*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
VARIABILITY OF PREDICTION OF MAXIMAL OXYGEN CONCUMPTION ON THE CYCLE ERGOMETER USING STANDARD EQUATIONS
MICHAEL C. GREENISEN, SUZANNE M. FORTNEY, STUART M. C. LEE (Krug Life Sciences, Inc., Houston, TX.), ALAN D. MOORE (Krug Life Sciences, Inc., Houston, TX.), and LINDA H. BARROWS (Krug Life Sciences, Inc., Houston, TX.) Sep. 1993 11 p
(NASA-TP-3412; S-737; NAS 1.60:3412) Avail: CASI HC A03/MF A01

Several investigations within the Exercise Countermeasures Project at the NASA Johnson Space Center focused on the assessment of maximum oxygen consumption (VO2(sub max)) within the Astronaut Corps pre- and postspace flight. Investigations during the Apollo era suggested that there was a significant decrease in postflight VO2(sub max) when compared to preflight values, and current studies have documented that this trend continues in the Space Shuttle era. It is generally accepted and was confirmed in our laboratory that VO2(sub max) can be predicted from submaximal measures taken during graded exercise tests on the cycle ergometer with respect to populations. However, previous work had not examined the effect of day-to-day variations in the physiologic responses that might alter these predictions for individuals. Stability of individual submaximal data over serial tests is important so that predicted changes in VO2(sub max) are reflective of actual VO2(sub max) changes. Therefore, the purpose of this investigation was to determine which of the accepted equations to predict VO2(sub max) would be less affected by normal daily physiologic changes. Author (revised)

N94-14097*# Alabama A & M Univ., Normal.
CHARACTERIZATION OF SPIRULINA BIOMASS FOR CELSS DIET POTENTIAL
MAHASIN G. TADROS Aug. 1993 41 p
(Contract NCC2-501)
(NASA-CR-194123; NAS 1.26:194123) Avail: CASI HC A03/MF A01

Cyanobacteria, Spirulina maxima as a biogenerative photosynthetic and an edible alga for the space craft crew in a CELSS, was evaluated in an effort to increase the growth rate, biomass, yield, and chemical analysis in continuous cultures. The cell characteristics were determined for cultures maintained at steady state with respect to the substrate concentration. The productivity increased in experiments exposed to low light (30 uE m(exp -2)s(exp -1). Oxygen evolved and protein production were higher in cultures exposed to low light intensity. There was a relationship between nitrate concentration and the yield of the culture. Increasing the concentration of nitrate in the growth medium up to 20 mM was enough to produce a culture having the same chemical composition as that of complete medium. High light was inhibiting the yield of the culture. Increasing the concentration of phosphate beyond 1 mM did not improve the yield of the culture. Increasing the concentration of sodium chloride in the growth medium did not affect the growth of the alga up to 0.1 M but beyond that the culture started to be stressed. The response to stress appeared in high production of total carbohydrate on the expense of protein production. The oxygen production was also higher in cultures stressed with sodium chloride. Author

N94-14128# National Defence Research Establishment, Umea (Sweden).
THE SURFACE-LOCATED YOPN PROTEIN IS INVOLVED IN CALCIUM SIGNAL TRANSDUCTION IN YERSINIA PSEUDOTUBERCULOSIS
A. FORSBERG, A.-M. VIITANEN (Turku Univ., Finland.), M. SKURNIK (Turku Univ., Finland.), and H. WOLF-WATZ (Umea Univ., Sweden.) 1991 10 p Sponsored by Sigrid Juselius Foundation; Emil Aaltonen Foundation; and Farmos Research and Science Foundation Repr. from Molecular Microbiology, v. 5, no. 4, 1991 p 977-986
(Contract SMRC-07490-040; BU-4426-30; STUF-90-00577)
(ISSN 0281-0263)
(FOA-B-40416-4.4; ETN-93-93761) Avail: CASI HC A02/MF A01

The low calcium response is strongly conserved among the pathogenic Yersinia species and is observed when the pathogen is grown at 37 C in Ca(2+) depleted medium. This response is characterized by a general metabolic downshift and by a specific induction of virulence plasmid encoded Yop (Yersinia outer membrane protein) genes. Regulation of the Yop expression is exerted at a transcriptional level by a temperature regulated activator and by Ca(2+) regulated negative elements. The YopN gene was shown to encode a protein (formerly also designated Yop4b) which is surface located when Yersinia is grown at 37 C. YopN was found to be part of an operon that is induced during the low calcium response. Insertional inactivation of the YopN gene resulted in derepressed transcription of Yop genes. A hybrid plasmid containing the YopN gene under the control of the tac promoter fully restored the wild type phenotype of the YopN mutant. Thus, the surface located YopN somehow senses the calcium concentration and transmits a signal to shut off Yop transcription when the calcium concentration is high. ESA

N94-14129# National Defence Research Establishment, Umea (Sweden). Cell and Microbiology Dept.
ANALYSIS OF THE V ANTIGEN LCRGVH-YOPBD OPERON OF YERSINIA PSEUDOTUBERCULOSIS: EVIDENCE FOR A REGULATORY ROLE OF LCRH AND LCRV
THOMAS BERGMAN (Umea Univ., Sweden.), SEBASTIAN HAAKANSSON (Umea Univ., Sweden.), AAKE FORSBERG, LENA NORLANDER, ANNA MACELLARO, ASSAR BAECKMAN (Umea Univ., Sweden.), INGRID BOELIN, and HANS WOLF-WATZ (Umea Univ., Sweden.) 1991 10 p Repr. from Journal of Bacteriology, v. 173, no. 5, Mar. 1991 p 1607-1616
(Contract SMRC-07490-040; BU-4426-30; STUF-90-00577)
(ISSN 0281-0263)
(FOA-B-40417-4.4; ETN-93-93762) Copyright Avail: CASI HC A02/MF A01

It is shown that the V antigen containing operon of Yersinia pseudotuberculosis is a polycistronic operon having the gene order lcrGVH-YopBD. Deoxyribonucleic Acid (DNA) sequencing analysis of lcrGVH revealed a high homology to the corresponding genes of Yersinia pestis. LcrG was conserved and LcrH showed only one amino acid different, while LcrV showed only 96.6% identity. The amino acid substitutions of LcrV occurred in the central domain of the protein, while the two ends of the protein were conserved. Northern (ribonucleic Acid (RNA)) blotting experiments showed that the operon is regulated at the transcriptional level by the extracellular stimuli temperature and calcium. One 4.6 Kb transcriptional product of the operon was identified. The mRNA is rapidly processed at its 5' end, resulting in different mRNA species of variable stability. By genetic analysis, the lcrV and lcrH gene products were found to be regulatory proteins having important roles in the Ca(2+) controlled regulation of Yop (Yersinia outer membrane protein) expression. The activity of LcrH is modulated by a gene product of the operon that inhibits the negative action of LcrH on Yop transcription in the absence of Ca(2+). ESA

N94-14494*# Alabama Univ., Huntsville.
CELLULAR RESPONSES TO LOW-GRAVITY: PILOT STUDIES ON SUBORBITAL ROCKETS AND ORBITING SPACECRAFT Final Report, 1 Oct. 1991 - 30 Sep. 1993
MARIAN L. LEWIS 30 Sep. 1993 40 p
(Contract NAGW-2739)
(NASA-CR-194402; NAS 1.26:194402) Avail: CASI HC A03/MF A01

The allocated funding supported, in part, experiments conducted on two Consort sounding rockets and five Shuttle flights. The primary parameters investigated were signal transduction in response to various mediators, cellular differentiation and metabolism in microgravity, and effect of microgravity on cytoskeletal morphology. Achievements include: demonstration of effect of spaceflight on the actin cytoskeleton in mouse osteoblasts and frog cells; confirmation that the T cell receptor-mediated signal transduction pathway in T lymphocytes is not affected by low-gravity

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compared to non-TCR-mediated stimulation (Con-A) which classically does not promote proliferative response; indication that microgravity may allow separation of proliferative signaling and secretory function in lymphocytes; demonstration that T lymphocytes and bone cells utilized less glucose indicating a shift in metabolism and confirming Spacelab results with WI-38 cells which used significantly less glucose, during spaceflight; confirmation that activation of human splenic B cells with a number of different mediators is not affected during spaceflight; demonstration of increased prostaglandin synthesis during reduced bone cell growth suggesting an effect of microgravity on prostaglandin-induced mitogenesis. The funding contributed significantly to the database described above and resulted in submission of six collaborative abstracts in 1993 (five to the ASGSB Annual Meeting and one to the ASCB Annual Meeting). Two abstracts were presented at the 1992 ASGSB Annual Meeting in Tucson. In addition, several peer reviewed papers are being generated and data will be included as background in preparation of future proposals, which hopefully will allow us to continue this type of extremely productive collaborative research.

Author (revised)

N94-14509# Yale Univ., New Haven, CT.
THE FIRST STEPS OF CHLOROPHYLL SYNTHESIS: RNA INVOLVEMENT AND REGULATION
D. SOELL 1992 5 p
(Contract DE-FG02-87ER-13734)
(DE93-014398; DOE/ER-13734/4) Avail: CASI HC A01/MF A01

Glu-tRNA(sup Glu) is synthesized from glutamate and tRNA(sup Glu) by glutamyl-tRNA synthetase (GluRS). Recent work has demonstrated that Glu-tRNA(sup Glu) has dual functions and is a precursor for protein and 5-aminolevulinate (ALA) synthesis. Current data does not provide compelling evidence for the notion that GluRS is regulated by chlorophyll precursors or in concert with the other enzymes of ALA synthesis. We have redefined the C5-pathway as a two-step route to ALA starting with Glu-tRNA(sup Glu). Only two enzymes, Glu-tRNA reductase (GluTR) and GSA-2,1-amino-mutase (GSA-AM), are specifically involved in ALA synthesis. We have purified these enzymatic activities from Chlamydomonas and demonstrated that the two purified proteins in the presence of their cofactors NADPH and pyridoxal phosphate are sufficient for the in vitro Glu-tRNA (yields) ALA conversion. We have cloned the genes encoding GluTR. The sequences of the GluTR proteins deduced from these genes share highly conserved regions with those of bacterial origin. We have also cloned and analyzed the gene encoding GSA-AM from Arabidopsis. As in Salmonella typhimurium, there are indications of the existence of an additional pathway for ALA formation in E. coli. To shed light on the recognition of the single tRNA(sup Glu) by the chloroplast enzymes GluTR, GluRS, we characterized a chlorophyll-deficient mutant of Euglena having tRNA(sup Glu) with a point mutation in the T(Psi)C-loop. The altered tRNA supports protein but not ALA synthesis. DOE

N94-14596# Washington Univ., Seattle. Dept. of Applied Mathematics.
CHAOS AND MICROBIAL SYSTEMS
M. KOT Oct. 1992 5 p
(Contract DE-FG06-90ER-61034)
(DE93-016814; DOE/ER-61034/2) Avail: CASI HC A01/MF A01

The field of nonlinear dynamics has generated a variety of new techniques for identifying order in seemingly chaotic systems. These techniques have led to new insights for several ecological and epidemiological systems, most notably childhood disease epidemics. To better test the efficacy and relevance of these new techniques to population biology research with two components namely a mathematical analysis of some simple microbial models with chaotic dynamics; and experimental (chemostat) population studies to evaluate the accuracy of these models. I have completed a thorough analysis of the forced double-Monod model and of the phase-locking route to chaos that it exhibits. I have also analyzed a simpler pulsed system with mass action kinetics and a period-doubling route to chaos. This research also motivated detailed analyses of discrete-time predator-prey and dispersal models, and a fast new method for computing fractal dimension. My colleagues and I have assembled a complete laboratory system to determine the appropriateness of the forced double-Monod model. We have tested assays for concentration and density and have performed a variety of diagnostic tests on this system. We have measured growth parameters for bacteria and for protozoa in chemostat. DOE

N94-14802 Northwestern Univ., Evanston, IL.
STRUCTURES AND SHEAR RESPONSE OF LIPID MONOLAYERS
P. DUTTA and J. B. KETTERSON Feb. 1993 19 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-FG02-84ER-45125)
(DE93-015076; DOE/ER-45125/10) Avail: CASI HC A03

This report discusses our work during the last 3 years using x-ray diffraction and shear measurements to study lipid monolayers (membranes). The report is divided into: (1) structure--phase diagram of saturated fatty acid Langmuir monolayers, effect of head group interactions, and studies of transferred monolayers (LB films); and (2) mechanical properties--fiber optic capillary wave probe and centrosymmetric trough, mechanical behavior of heneicosanoic acid monolayer phases. DOE

N94-14852# Norwegian Defence Research Establishment, Kjeller. Div. for Environmental Toxicology.
A CHARACTERIZATION OF CARBOXYLESTERASES IN RAT AND GUINEA PIG: THEIR HETEROGENEITY AND ROLE IN DETOXICATION OF ORGANOPHOSPHORUS COMPOUNDS
Ph.D. Thesis - Oslo Univ.
ROLF GAUSTAD Sep. 1993 51 p
(ISSN 0800-4412)
(NDRE-PUBL-93-1001) Avail: CASI HC A04/MF A01

The present study deals with the molecular properties of carboxylesterases (CarbEs) and the ability of the various isoenzymes to detoxify organophosphorus compounds. CarbE isoenzymes have been separated from lungs, livers, plasma and small intestines of rats and guinea pigs mainly by chromatofocusing. One of the isoenzymes in rat lung, pI 5.8, has been purified to near homogeneity. This isoenzyme has a molecular mass of approx 180 kDa with subunits of 60 kDa, and by Edman degradation the first 19 amino acid residues were determined. Monoclonal antibodies (MAbs) were prepared against the purified isoenzyme and used in enzyme-linked immunosorbent assays (ELISA) to distinguish between the CarbE isoenzymes in the different tissues. The molecular and immunological results showed a strong relationship between lung CarbE, pI 5.8, and the rat liver CarbE, pI 6.0. The MAbs were strongly bound to the high pI forms of the CarbE isoenzymes in plasma and small intestine from rats and guinea pigs, but not to the low pI forms. This indicates that at least two immunochemically distinct categories of isoenzymes are present in both plasma and intestine. Furthermore, the properties of the differenct CarbE isoenzymes with regard to inhibition by selected organophosphorus compounds were studied in vitro and in vivo. With some exemption the inhibition constants showed small differences between isoenzymes. Subcutaneous and intraperitonal administration of paraoxon and diisopropyl phospho fluoridate (DFP) rapidly inhibited the CarbE activity in guinea pig plasma, much higher doses were necessary to obtain a marked inhibition in lung and liver, and about 25 percent of CarbE activity in lung was resistant to inhibition. Gel filtration of lung homogenate after treatment with organophosphorus compuonds showed that CarbE activity in one of the molecular mass fractions was weakly inhibited. This might be due to different subcellular localization of the isoenzymes and thereby reduced accessibility to some of the lung CarbE isoenzyes. The experiments showed that the efficacy for detoxication is a function of the relative affinities of the organophosphorus compounds for CarbEs and acetyl cholinesterase (AChE). For compounds like paraoxon and DFP, with lower affinities for AChE than for CarbEs, also the lung and liver CarbEs contribute to the detoxication process. The

distributions of CarbEs in separated rat liver cells were investigated by polyacrylamide gel electrophoresis (PAGE). All of the liver CarbE isoenzymes could be detected in the parenchymal cells, whereas in both Kupffer cells and endothelial cells only those with pI 6.4/6.2, also termed mono acylglyceral lipase, could be detected.
Author (revised)

N94-14862# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
ETHOLOGY IN SPACE, A UNIQUE OPPORTUNITY FOR BEHAVIOURAL SCIENCE
R. E. STARK and S. R. HEERD, ed. Mar. 1993 99 p
(ISSN 0379-4067)
(ESA-STM-246, ISBN-92-9092-208-7; ETN-93-94410) Copyright Avail: CASI HC A05/MF A02

The current status of experiments performed under space flight conditions using animals as subjects is reviewed and summarized. Some potential experimental approaches to study the behavioral responses and acclimatization of animals to the space environment are proposed. Future areas of required behavioral research are presented, and some of the peculiarities associated with the development of a life science experiment and its equipment specifically for behavioral studies in space are shown. The following are also advertized: the availability of the space environment to the European behavioral science community, to encourage behavioral scientists to think in terms of experimentation under microgravity conditions and to stimulate them in generating new ideas and proposals for flight experiments. ESA

N94-14899# San Diego State Univ., CA. Center for Hydro-Optics and Remote Sensing.
NONLINEAR RELATIONSHIPS BETWEEN PARTICULATE ABSORPTION AND CHLOROPHYLL: DETRITUS OR PIGMENT PACKAGING? Final Report
JOAN S. CLEVELAND 15 Jun. 1993 21 p
(Contract N00014-92-J-1012)
(AD-A266806; TM-008-93) Avail: CASI HC A03/MF A01

Relationships for predicting phytoplanktonic absorption at 676 and 436 nm from chlorophyll alpha concentration have been developed for distinct geographic regions defined by latitude. The forms of the predictive equations are controlled by underlying biological mechanisms and lend insight into these mechanisms. Development of these region-specific models allows prediction of phytoplanktonic absorption from more easily measured parameters such as chlorophyll alpha concentration or in situ fluorescence and increases accuracy in modelling optical properties or primary production rate using specific absorption coefficients. Temperate and tropical regions exhibited nearly identical relationships at low chlorophyll so these regions were combined and treated as one.
DTIC

N94-14918# Naval Medical Research Inst., Bethesda, MD.
NEUROPEPTIDE-Y (NPY) INCREASES TOTAL BLOOD FLOW IN THE TAIL, AND REDUCES CUTANEOUS MICROVASCULAR BLOOD FLOW IN THE TAIL AND FOOT OF THE RAT Technical Report, 1990 - 1991
M. E. HEATH and J. R. THOMAS 10 Feb. 1993 22 p
(Contract DA PROJ. MR0-4120)
(AD-A266839; NMRI-93-34) Avail: CASI HC A03/MF A01

The purpose of this study was to describe the in vivo effects of neuropeptide-Y (NPY) on total blood flow (BF(sub T)) and on microvascular skin blood flow (BF(sub sk)) in appendages of a whole animal model. This study is important to understanding the medical relevance of NPY in cardiovascular physiology. The tail and foot of the rat were used as the model. BF(sub sk) and skin temperature (T(sub sk)) were measured on the foot pad and mid-way along the tail with a laser Doppler flowmeter and a 40-gauge thermocouple. BF(sub T) was measured mid-way along the tail (distal to the laser Doppler flowmeter) via venous occlusion plethysmography. NPY (16, 32, 64, and 128 microgram/kg), norepinephrine (NE) (25, 50, 100, and 400 microgram/kg), or saline alone was administered i.v. in 300 microliter volume. NE caused marked reductions in blood flow at all three sites. The duration of the contraction was correlated with the dose. NPY caused immediate marked decreases in BF(sub sk) and significant increases in tail BF(sub T), tail blood volume, and tail T(sub sk). The magnitude and duration of the changes in BF were correlated to dose. These results indicte that some vessels in the tail are dilating in response to NPY. The most likely site of this vasodilation is the arteriovenous anastoma (AVA), which are shunts between arterioles and veins. When AVA's are open, the blood volume in the tissue increases, and the BF through the tissue increases because of the decrease in resistance, and capillary BF(sub sk) often decreases as blood follows the path of least resistance. T(sub sk) also increases when AVA's are opened. DTIC

N94-15138 Materials Research Society, Pittsburg, PA.
MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS, VOLUME 292: BIOMOLECULAR MATERIALS
CHRISTOPHER VINEY, ed. (Washington Univ., Seattle.), STEVEN T. CASE, ed. (Mississippi Univ., Jackson.), and J. H. WAITE, ed. (Delaware Univ., Lewes.) 3 Dec. 1992 300 p Symposium held in Boston, MA, 1-3 Dec. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0120) (ISSN 0272-9172)
(AD-A265776) Avail: CASI HC A13

Biological materials are naturally occurring substances produced and utilized internally or externally by living organisms. In contrast, biomolecular materials are partial, complete, or modified replicas of biological materials whose synthesis and utilization may be unrelated to their original biological source. Whether the objective is to replicate the properties of a biological material, or to produce derivatives with novel properties, the ultimate goal is to attain biomolecular materials that have industrial, medical, or agricultural applications. This symposium, held at the 1992 Fall Meeting of the Materials Research Society, brought together an interdisciplinary group of scientists (zoologists, molecular biologists, biochemists, inorganic and organic chemists, materials scientists, and mathematicians) that are directly or indirectly involved in some aspect of biomolecular materials research. The diversity of biological (Nature's) materials was amply demonstrated: cockroach elastin, mussel adhesives, trematode and avian eggshells, spider and midge silks, abalone shell, rhinoceros horn, algal pigments, a bacterial hemolytic protein, and nut shells. Descriptions of these biological systems ranged from the relatively unknown to detailed information regarding the structure, composition, processing, and physical properties of the biological material. In several instances, particularly for protein-based polymers, biomolecular materials have been obtained by cellular synthesis through biotechnology. Bacterial cells have been engineered to synthesize discrete portions of insect silk and mussle adhesive proteins, multifunctional proteins with a unique combination of multiple binding sites, and recombinant proteins with specific combinations of functional groups that lead to ordered assembly into supramolecular complexes. DTIC

N94-15235* National Aeronautics and Space Administration, Washington, DC.
PLANT RESEARCH (Videotape)
Apr. 1985 Videotape: 3 min. 14 sec. playing time, in color, with sound
(NASA-TM-109664; NONP-VT-93-190462) Avail: CASI VHS A01/BETA A22

This video presentation addresses Stennis research on the use of plants for the purification of water and air for living in space and on Earth. CASI

N94-15378* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-29 CREW WITH STUDENT EXPERIMENT (Videotape)
Feb. 1989 Videotape: 15 min. playing time, in color, with sound
(NASA-TM-109545; NONP-VT-93-190342) Avail: CASI VHS A01/BETA A22

John Vellinger, student experimenter, and Mark Deuser, Kentucky Fried Chicken Sponsor, are shown explaining the Chicken Embryo experiment to the crew. CASI

N94-15548*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FAULT MANAGEMENT FOR DATA SYSTEMS
MARK A. BOYD, DAVID L. IVERSON, and F. ANN PATTERSON-HINE Sep. 1993 23 p Sponsored by NASA, Washington
(Contract RTOP 476-14-03)
(NASA-TM-103953; A-92147; NAS 1.15:103953) Avail: CASI HC A03/MF A01

Issues related to automating the process of fault management (fault diagnosis and response) for data management systems are considered. Substantial benefits are to be gained by successful automation of this process, particularly for large, complex systems. The use of graph-based models to develop a computer assisted fault management system is advocated. The general problem is described and the motivation behind choosing graph-based models over other approaches for developing fault diagnosis computer programs is outlined. Some existing work in the area of graph-based fault diagnosis is reviewed, and a new fault management method which was developed from existing methods is offered. Our method is applied to an automatic telescope system intended as a prototype for future lunar telescope programs. Finally, an application of our method to general data management systems is described.
Author (revised)

N94-15633# Delaware Univ., Newark. Coll. of Marine Studies.
CHARACTERIZATION OF SPATIAL AND TEMPORAL VARIABILITY OF PHYTOPLANKTON BLOOMS IN COASTAL WATERS Final Report
V. KLEMAS 1 Mar. 1993 11 p
(Contract N00014-91-J-1737)
(AD-A267102) Avail: CASI HC A03/MF A01

The tide-related parameters of the Delaware Bay are derived from space shuttle time-series photographs. The water areas in the bay are measured from interpretation maps of the photographs with a CALCOMP 9100 digitizer and ERDAS Image Processing System. The corresponding tidal levels are calculated using the exposure time annotated on the photographs. From these data, an approximate function relating the water area to the tidal level at a reference point is determined. Based on the function, the water areas of the Delaware Bay at mean high water (MHW) and mean low water (MLW), below 0 m, and for the tidal zone are inferred. With MHW and MLW areas and the mean tidal range, we calculate the tidal influx of the Delaware Bay, which is 2.76(10)(exp 9) cu m. Furthermore, the velocity of flood tide at the bay mouth is determined using the tidal flux and an integral of the velocity distribution function at the cross section between Cape Henlopen and Cape May. The result is 132 cm/s, which compares well with the data on tidal current charts. DTIC

N94-15643# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France). Equipe Conduite Automatique de Procedes Biotechnologiques.
CONTRIBUTION TO THE ELABORATION OF SOME ADAPTIVE CONTROL ALGORITHMS FOR FERMENTATION PROCESSES MONITORING Ph.D. Thesis - Toulouse Univ. [CONTRIBUTION A L'ELABORATION D'ALGORITHMES DE COMMANDE ADAPTATIVE POUR LA CONDUITE DE PROCEDES FERMENTAIRES]
GILLES ROUX 1992 201 p In FRENCH
(LAAS-92513; ETN-93-94405) Avail: CASI HC A10/MF A03

Several problems arising from the continuous fermentation process monitoring are studied. Nonlinear systems control as well as flexible and robust adaptive control techniques are discussed. They are of crucial interest for an efficiency monitoring of the biotechnological processes. These techniques are based on the implementation of parameter estimation procedures for the modeling and real time tracking of certain physical values characterizing the process operation. They also appeal to filtering techniques for the estimation of non-measured relevant quantities which determine the process evolution. These processes are clearly nonstationary processes and ask for the development of adaptive linear or nonlinear control methods. They allow the representation of the model nonlinearities and the parameter variations to be taken into consideration. Algorithms using the inherent nonlinear structure of the fermentation process models were developed, using a single variable, then a multivariate case was studied. The control laws were theoretically studied then validated on an experimental plant. ESA

N94-15662# Naval Command, Control and Ocean Surveillance Center, San Diego, CA.
LOOKING AT FOKKER-PLANCK DYNAMICS WITH A NOISY INSTRUMENT
GABOR SCHMERA, ADI BULSARA, DAVID PIERSON, FRANK MOSS, and ENRICO DICERA May 1993 3 p
(AD-A267049) Avail: CASI HC A01/MF A01

We consider the class of experiments which can be characterized by a Fokker-Planck dynamics corresponding to the overdamped motion of a state point in a suitable stochastic potential. We assume that the general form of the potential is known (or can be guessed with reasonable accuracy), but that its parameters are to be determined experimentally by measurements made with a noisy instrument. This possible method for determining the potential parameters, which exploits the system's own internal stochastic motion in order to rapidly explore its available parameter space, is substantially more efficient than traditional methods involving time averages of single point measurements, and yet does not appear to have been previously considered. The method could be important, when, for example, the experiment must be completed in a limited time owing either to the expense of the experimental materials or to the temporary stationarity of the preparation, situations which are commonly encountered in experimental biochemistry and biology. DTIC

N94-15967*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
QUANTITATIVE METHOD OF MEASURING CANCER CELL UROKINASE AND METASTATIC POTENTIAL Patent Application
DENNIS R. MORRISON, inventor (to NASA) 27 Jul. 1993 27 p
(NASA-CASE-MSC-21715-1; NAS 1.71:MSC-21715-1; US-PATENT-APPL-SN-097186) Avail: CASI HC A03/MF A01

The metastatic potential of tumors can be evaluated by the quantitative detection of urokinase and DNA. The cell sample selected for examination is analyzed for the presence of high levels of urokinase and abnormal DNA using analytical flow cytometry and digital image analysis. Other factors such as membrane associated urokinase, increased DNA synthesis rates and certain receptors can be used in the method for detection of potentially invasive tumors. NASA

N94-15969*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CULTURED NORMAL MAMMALIAN TISSUE AND PROCESS Patent Application
THOMAS J. GOODWIN, inventor (to NASA) (Krug Life Sciences, Inc., Houston, TX.), TACEY L. PREWETT, inventor (to NASA), DAVID A. WOLF, inventor (to NASA), and GLENN F. SPAULDING, inventor (to NASA) 25 May 1993 40 p
(NASA-CASE-MSC-21984-1; NAS 1.71:MSC-21984-1; US-PATENT-APPL-SN-066292) Avail: CASI HC A03/MF A01

Normal mammalian tissue and the culturing process has been developed for the three groups of organ, structural and blood tissue. The cells are grown in vitro under microgravity culture conditions and form three dimensional cell aggregates with normal cell function. The microgravity culture conditions may be microgravity or simulated microgravity created in a horizontal rotating wall culture vessel. NASA

N94-16094 British Columbia Univ., Vancouver.
STATISTICAL TECHNIQUES FOR STUDY DESIGN OF MICROGRAVITY LIFE SCIENCES EXPERIMENTS
F. A. GAGNON, L. E. SUSAK, P. C. WING, F. GLICK, and I. K. Y. TSANG *In* National Research Council Canada, Proceedings of

the Second Workshop on Microgravity Experimentation 3 p 1990
Avail: Issuing Activity (National Research Council, Publication Sales and Distribution, Montreal Road, Ottawa, Ontario, K1A OR6 Canada)

Small N techniques are known by such names as single system, interrupted time series, intrasubjects replication designs, single subject, or idiographic research. These techniques are ideal for application to the microgravity life sciences field, where large N studies are not feasible because they would be extremely costly and take years to conduct. Small N study techniques are the only viable method for obtaining the optimum scientific value from studies performed on the limited number of subjects in the limited time available in microgravity. The small N techniques are dependent on establishing a basic level of the dependent variable for each subject, then introducing the independent variable to determine whether there is a change in the dependent variable. Steps to be used in performing small N studies in practice are outlined. Author (CISTI)

N94-16441# Du Pont de Nemours (E. I.) and Co., Wilmington, DE.
BIOORGANIC MODELS FOR PROTEIN ION CHANNELS Progress Report, 30 Jun. 1991 - 1 Jun. 1992
WILLIAM F. DEGRADO 1 Jun. 1992 7 p
(Contract N00014-90-C-0083)
(AD-A266365) Avail: CASI HC A02/MF A01

Biophysical characterization of ion channel peptides is discussed. We are using single-channel voltage clamp methods to study the model ion channel peptide, Ac-(LSSLLSL)3-CONH2 in an attempt to determine how selective it is for the conductance of cations versus anions. Both ends of the peptide are masked with neutral blocking groups allowing us to eliminate effects that are due to formal charges. Because the peptides can reorient upon a voltage change, we must use voltage pulses or fast ramps (approximately 100 msec) to measure full current-voltage relations on single open channels; the longer lifetime of the acetylated peptide facilitates this measurement. The open channel 1-5 relation rectifies in symmetrical 1 M KC1, with larger currents at the holding potential than at the opposite potential. According to our gating model, the larger currents flow from C-terminus to N-terminus. DTIC

N94-16514 Wisconsin Univ., Madison.
ISOLATION OF THERMOSTABLE ENZYME MUTANTS BY CLONING AND SELECTION IN THERMOPHILIC BACTERIA Final Technical Report, 1 Jul. 1989 - 31 Dec. 1992
HANS H. LIAO 22 Jun. 1993 4 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-J-3134)
(AD-A266378) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The objective of this project was to isolate thermostable variants of enzymes and to understand the molecular basis for their increased stability. Such variants may be isolated by introducing the gene encoding the enzyme into a thermophile and selecting for enzymatic activity at the high growth temperatures of these organisms. Thermostable mutants of kanamycin nucleotidyl transferase (KNTase) were obtained in this way and found to be also more resistant to chemical denaturants, to protease, and to inclusion body formation during their overexpression in Escherichia coli. The tools for obtaining mutants at up to 80 C by cloning in Thermus thermophilus, including a plasmid that transforms and expresses heterologous genes in this thermophile, were constructed, and more thermostable mutants of KNTase were isolated. Crystals of a thermostable KNTase were obtained and the structure was solved to 2.7A; comparison with the wildtype structure will allow correlation of the known genetic change with the structural basis for enhanced stability. Work was also begun on isolating thermostable mutants of another enzyme, chloramphenicol acetyltransferase. DTIC

N94-16545# Letterman Army Inst. of Research, San Francisco, CA.
HEAT SHOCK PROTEIN INDUCTION IN HUMAN CELLS BY CO2 LASER IRRADIATION Final Report
RONALD E. FERRANDO, STEVEN T. SCHUSCHEREBA, PHILLIP D. BOWMAN, JULIE A. QUONG, and JANET M. YANG 14 Jun. 1993 54 p
(AD-A266430; LAIR-486) Avail: CASI HC A04/MF A01

This study investigated the effect of millisecond exposures from a carbon dioxide (CO2) laser on the production of heat shock proteins in human fibroblast cell cultures. Heat shock or stress proteins (hsp) are induced to high levels by heat shock, transition series and heavy metals, amino acid analogs, certain chemicals, and ultraviolet radiation. These proteins are highly conserved throughout nature and their regulation and cellular functions are just beginning to be understood. The production of hsps was monitored by S-35-methionine incorporation into newly synthesized heat shock protein and by immunocytochemistry. It was shown that CO2 laser irradiation could induce the production of hsps. The time course of hsp synthesis and localization within cells was also determined. The hsp synthesis produced by the CO2 laser was compared to the effects of sodium arsenite and heat. The results of this study indicate that hsp 70 is the major heat shock protein induced by CO2 laser radiation and that this response is most likely due to the thermal effects of the laser. DTIC

N94-16893# Argonne National Lab., IL.
TRANSRAPID TR-07 MAGLEV-SPECTRUM MAGNETIC FIELD EFFECTS ON DAILY PINEAL INDOLEAMINE METABOLIC RHYTHMS IN RODENTS
K. R. GROH 1993 6 p Presented at the 12th International Conference on Magnetically Levitated Systems and Linear Drives, Argonne, IL, 19-21 May 1993
(Contract W-31-109-ENG-38)
(DE93-015143; ANL/BIM/CP-79650; CONF-930550-1) Avail: CASI HC A02/MF A01

This study examined the effects on pineal function of magnetic field (MF) exposures (ac and dc components) similar to those produced by the TransRapid TR-07 and other electromagnetic maglev systems (EMS). Rats were entrained to a light-dark cycle and then exposed to a continuous, or to an inverted, intermittent (on = 45 s, off = 15 s, induced current = 267 G/s) simulated multifrequency ac and dc magnetic field (MF) at 1 or 7 times the TR-07 maglev vehicle MF intensity for 2 hr. Other groups of rats were exposed to only the ac or the dc-component of the maglev MF. For comparison, one group was exposed to an inverted, intermittent 60-Hz MF. Each group was compared to an unexposed group of rats for changes in pineal melatonin and serotonin-N-acetyltransferase (NAT). MF exposures at an intensity equivalent to that produced by the TR-07 vehicle had no effect on melatonin or NAT compared with sham-exposed animals under any of the conditions examined. However, 7X TR-07-level continuous 2-h MF exposures significantly depressed pineal NAT by 45%. Pineal melatonin was also depressed 33-43% by a continuous 7X TR-07 MF exposure and 28% by an intermittent 60-Hz 850-mG MF, but the results were not statistically significant. This study demonstrates that intermittent, combined ac and dc MF's similar to those produced by the TR-07 EMS maglev vehicle alter the normal circadian rhythm of pineal indoleamine metabolism. The pineal regulatory enzyme NAT was more sensitive to MF exposure than melatonin and may be a more desirable measure of the biological effects of MF exposure. DOE

N94-16989# Illinois Univ., Urbana.
BIOFILM STRUCTURE AND DIVERSITY Final Technical Report
DAVID A. STAHL 1993 5 p
(Contract N00014-92-J-1710)
(AD-A267254) Avail: CASI HC A01/MF A01

The objective of this project is to develop molecular measures of the identity, activity, and spatial distribution of microbial populations making up natural (multispecies) biofilms. A further goal of this project is to use biofilm bioreactors to characterize

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the relationship between biochemical transformations and community structure, focusing on the terminal steps of anaerobic mineralization and emphasizing competitive and cooperative interactions among sulfate-reducing and methanogenic biofilm populations. Long term objectives include the identification and characterization of obligate symbioses among attached microbial populations and the refinement of mathematical models to predict the behavior of biofilm communities. DTIC

N94-17090*# Wright State Univ., Dayton, OH.
EVALUATION OF PUTATIVE NEUROCHEMICAL INTERMEDIARIES IN SPACE/MOTION SICKNESS Final Report, 1 Jan. 1966 - 31 Dec. 1991
JAMES B. LUCOT and GEORGE H. CRAMPTON 31 Dec. 1991 23 p
(Contract NCC2-229)
(NASA-CR-193607; NAS 1.26:193607) Avail: CASI HC A03/MF A01

The topics covered include the following: the emetic stimuli used on the cats in the study; analysis of the constituents of the cerebral spinal fluid (CSF) during motion sickness; evaluation of serotonin-1A agonists; other 5-HT receptors; and additional studies and activities. Derived from text

N94-17224# Society of Toxicology, Washington, DC.
FACTORS DETERMINING THE RELEASE OF NITRIC OXIDE Thesis Final Report, 1 Dec. 1991 - 30 Nov. 1992
JOAN WALSH CASSEDY 30 Nov. 1992 7 p
(Contract AF-AFOSR-0187-89)
(AD-A266232; AFOSR-93-0448TR) Avail: CASI HC A02/MF A01

Cortical collecting duct cells were cultured on permeable membranes and used to assess cellular transport properties for calcium/cadmium. Functional viability of the cells in culture were affirmed by their ability to absorb sodium and chloride, secrete protons and potassium, and respond appropriately to the hormones vassopressin and aldosterone. Calcium absorption by these cells was affected neither by sodium blockers or hormone inducers of cyclic AMP nor, surprisingly, by various calcium channel blockers. However, when the pH of the culture medium on the apical side of the cells was controlled artificially by buffer, calcium absorption was found to be affected. Decreasing the pH inhibited calcium uptake by cells, indicating that calcium and H+ transport were linked, possibly by a mechanism involving a H+/Ca++ exchanger. Cadmium had no apparent effect on calcium absorption until cadmium concentrations reached levels at which nonspecific, cytotoxic effects were observed. In another separate project, initial research efforts were undertaken to use electron paramagnetic resonance (EPR) to explain the mechanism by which endothelial/smooth muscle cells release the putative endothelium-derived relaxing factor (EDRF), nitric oxide (NO), from vasodilator drugs. DTIC

N94-17232# Georgia Inst. of Tech., Atlanta. Bioengineering Center.
BIOEFFECTS OF RADIOFREQUENCY RADIATION ON CELL GROWTH AND DIFFERENTATION. VOLUME 1: ENGINEERING CONSIDERATIONS Final Report, Jan. 1988 - Oct. 1991
DAVID L. BANKS, WESLEY W. SHELTON, and JAMES C. TOLER Jun. 1993 42 p
(Contract F33615-83-K-0600)
(AD-A267754; AL-TR-1992-0106-VOL-1) Avail: CASI HC A03/MF A01

This report details the engineering considerations of a program designed to investigate the effects of chronic low-level radiofrequency radiation (RFR) exposure on cell growth and differentiation. The protocol required the exposure (1 mW/cm2 20 hours daily, average, 7 days per week) of 200 female, mammary-tumor-prone mice (strain C3H/HeJ) to 435-MHz pulsed-wave (1.0 us pulse width, 1.0 kHz pulse rate) RFR for a duration of 21 months. In addition, a sham-exposure group consisting of 200 female, C3H/HeJ mice was housed under identical conditions, but not exposed to the 435-MHz pulsed-wave radiation. The program's engineering considerations involved developing and providing the facility and equipment used to expose the mammary-tumor-prone mice and the development of a procedure for reliable identification of the mice. Also described are the design of the antenna and transmitter system, animal caging, cage washing procedures, and the data collection system. DTIC

N94-17257*# National Aeronautics and Space Administration, Washington, DC.
THE 1990-1991 NASA SPACE BIOLOGY ACCOMPLISHMENTS
THORA W. HALSTEAD, ed. (George Washington Univ., Washington, DC.) Oct. 1993 259 p
(NASA-TM-4501; NAS 1.15:4501) Avail: CASI HC A12/MF A03

This report consists of individual technical summaries of research projects of NASA's Space Biology Program, for research conducted during the period May 1990 through May 1991. This program includes both plant and animal research, and is dedicated to understanding the role of gravity and other environmental factors on biological systems and to using the microgravity of the space environment as a tool to advance fundamental scientific knowledge in the biological sciences to improve the quality of life on Earth and contribute to NASA's goal of manned exploration of space. The summaries for each project include a description of the research, a list of the accomplishments, an explanation of the significance of the accomplishments, and a list of publications. Author

N94-17275# Delaware Univ., Lewes. Coll. of Marine Studies.
REGULATION OF ATTACHED BACTERIAL GROWTH BY ADSORBED PROTEINS Final Report, 1 May 1990 - 30 Jun. 1993
DAVID L. KIRCHMAN 28 Jul. 1993 4 p
(Contract N00014-90-J-1973)
(AD-A267756) Avail: CASI HC A01/MF A01

The general objective of this project was to examine one component of the primary biofilm, protein, which has been hypothesized to be a major component of both dissolved and adsorbed organic pools in seawater. In previous work we found that surface energy was important in determining adsorption of protein to surfaces in seawater and degradation rates by bacteria and bacterial growth. In the last phase of this work, we examined the chemical nature of actual protein in seawater using HPLC techniques which we developed, standard chemical assays, and bioassays. We showed that protein in seawater is not the same chemically as cellular protein. Bacteria appear to treat nearly all seawater protein as if it were glycolated and degrade it at much lower rates than unmodified, fresh protein. Other experiments showed that cellular protein introduced into seawater is quickly modified by abiotic reactions and becomes less easily hydrolyzed by bacterial proteases within hours. The abiotic reactions appear to include adsorption to small colloids. These results begin to explain the growth dynamics of microorganisms on surfaces and the origin of refractory organic matter which is highly abundant in seawater. DTIC

N94-17279*# New York Univ., New York. Dept. of Applied Science.
THE DYNAMICS OF HYDROPONIC CROPS FOR SIMULATION STUDIES OF THE CELSS INITIAL REFERENCE CONFIGURATIONS Final Report, 1 Apr. 1989 - 31 Aug. 1993
TYLER VOLK 31 Aug. 1993 45 p
(Contract NCC2-608)
(NASA-CR-194654; NAS 1.26:194654) Avail: CASI HC A03/MF A01

During the past several years, the NASA Program in Controlled Ecological Life Support Systems (CELSS) has continued apace with crop research and logistic, technological, and scientific strides. These include the CELSS Test Facility planned for the space station and its prototype Engineering Development Unit, soon to be active at Ames Research Center (as well as the advanced crop growth research chamber at Ames); the large environmental growth chambers and the planned human test bed facility at Johnson Space Center; the NSCORT at Purdue with new candidate

crops and diverse research into the CELSS components; the gas exchange data for soy, potatoes, and wheat from Kennedy Space Center (KSC); and the high-precision gas exchange data for wheat from Utah State University (USU). All these developments, taken together, speak to the need for crop modeling as a means to connect the findings of the crop physiologists with the engineers designing the system. A need also exists for crop modeling to analyze and predict the gas exchange data from the various locations to maximize the scientific yield from the experiments. One fruitful approach employs what has been called the 'energy cascade'. Useful as a basis for CELSS crop growth experimental design, the energy cascade as a generic modeling approach for CELSS crops is a featured accomplishment in this report. The energy cascade is a major tool for linking CELSS crop experiments to the system design. The energy cascade presented here can help collaborations between modelers and crop experimenters to develop the most fruitful experiments for pushing the limits of crop productivity. Furthermore, crop models using the energy cascade provide a natural means to compare, feature for feature, the crop growth components between different CELSS experiments, for example, at Utah State University and Kennedy Space Center. Author (revised)

N94-17729 Texas Univ. Health Science Center, San Antonio.
CELLULAR AND MOLECULAR LEVEL RESPONSES AFTER RADIOFREQUENCY RADIATION EXPOSURE, ALONE OR IN COMBINATION WITH X RAYS OR CHEMICALS Annual Technical Report, 1 Apr. 1992 - 31 Mar. 1993
MARTIN L. MELTZ 27 Jul. 1992 94 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0206-91)
(AD-A268189; K-GAUO-00-030-102; AFOSR-93-0586TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The focus of the second years' activities has been to establish, for the human 244B human lymphoblastoid cell line, selected biological effects of standard dose rate ionizing radiation (over the same low total dose range as to be used for combined microwave/ionizing radiation experiments) and hyperthermia (at the same temperature as will be used in the combined studies). The endpoints which have been examined, and for which alterations have been observed after either ionizing radiation exposure or heat treatment (for different times and temperatures), include cell proliferation and viability, cell cycle distribution, cell surface membrane markers, stress protein synthesis, DNA binding protein induction (NF-kB), and proto-oncogene induction. The observation of the two latter endpoints, at low doses, was unexpected. An interaction of ionizing radiation and hyperthermia, reducing stress protein synthesis, was also unexpected. Of the final 10 surface markers examined, 4 have been identified for their potential use in detecting either ionizing radiation or hyperthermia effects. DTIC

N94-17889# Brookhaven National Lab., Upton, NY.
IN VIVO ANIMAL MODELS OF BODY COMPOSITION IN AGING
S. YASUMURA, K. JONES, P. SPANNE, G. SCHIDLOVSKY, and L. WIELOPOLSKI 1992 7 p Presented at the Aging and Body Composition: Technological Advances and Physiological Interrelationships, Anaheim, CA, 7 Apr. 1992
(Contract DE-AC02-76CH-00016)
(DE93-012527; BNL-48787; CONF-9204244-1) Avail: CASI HC A02/MF A01

We developed several techniques that provide data on body elemental composition from in vivo measurements in rats. These methods include total body potassium by whole-body counting of endogenous K-40; total body calcium (TBCa), sodium, and chloride by in vivo neutron activation analysis; and total body phosphorus (TBP) and nitrogen (TBN) by photon activation analysis. These elements provide information on total body fat, total body protein, and skeletal mass. Measurements were made in 6-, 12- and 24-month-old rats. TBN increased slightly between 6 and 12 months but was significantly lower by 24 months, indicating a substantial loss in total body protein. Working at the National Synchrotron Light Source, we studied rat femurs by computed microtomography (CMT) and the elemental profile of the femur cortex by synchrotron-radiation induced X-ray emission (SRIXE). Although there were no significant changes in TBCa and TBP, indices of skeletal mass, CMT revealed a marked increase in the size and number of cavities in the endosteal region of the femur cortex with increasing age. The SRIXE analysis of this cortical bone revealed a parallel decrease in the endosteal Ca/P ratio. Thus, there are major alterations in bone morphology and regional elemental composition despite only modest changes in total skeletal mass. DOE

N94-18051# Pacific Northwest Lab., Richland, WA.
IMPROVING THE BIODEGRADATIVE CAPACITY OF SUBSURFACE BACTERIA
M. F. ROMINE and F. J. BROCKMAN Apr. 1993 16 p Presented at the 2nd International Symposium In Situ and On-Site Bioreclamation, San Diego, CA, 5-8 Apr. 1993
(Contract DE-AC06-76RL-01830)
(DE93-013171; PNL-SA-21765; CONF-930482-7) Avail: CASI HC A03/MF A01

The continual release of large volumes of synthetic materials into the environment by agricultural and industrial sources over the last few decades has resulted in pollution of the subsurface environment. Cleanup has been difficult because of the relative inaccessibility of the contaminants caused by their wide dispersal in the deep subsurface, often at low concentrations and in large volumes. As a possible solution for these problems, interest in the introduction of biodegradative bacteria for in situ remediation of these sites has increased greatly in recent years (Timmis et al. 1988). Selection of biodegradative microbes to apply in such cleanup is limited to those strains that can survive among the native bacterial and predator community members at the particular pH, temperature, and moisture status of the site (Alexander, 1984). The use of microorganisms isolated from subsurface environments would be advantageous because the organisms are already adapted to the subsurface conditions. The options are further narrowed to strains that are able to degrade the contaminant rapidly, even in the presence of highly recalcitrant anthropogenic waste mixtures, and in conditions that do not require addition of further toxic compounds for the expression of the biodegradative capacity (Sayler et al. 1990). These obstacles can be overcome by placing the genes of well-characterized biodegradative enzymes under the control of promoters that can be regulated by inexpensive and nontoxic external factors and then moving the new genetic constructs into diverse groups of subsurface microbes. The objective of this research is to test this hypothesis by comparing expression of two different toluene biodegradative enzymatic pathways from two different regulatable promoters in a variety of subsurface isolates. DOE

N94-18231# Tennessee Univ., Memphis. Dept. of Anatomy and Neurobiology.
SOMATOSENSORY RESPONSIVENESS IN BEHAVING MONKEYS AND HUMAN SUBJECTS Annual Report, 1 Jul. 1992 - 30 Jun. 1993
RANDALL J. NELSON 31 Jul. 1993 18 p
(Contract AF-AFOSR-0333-91)
(AD-A268924; AFOSR-93-0671TR) Avail: CASI HC A03/MF A01

Three research goals were accomplished during this second year. First, analysis of data indicated that sensory responsiveness of primary somatosensory (SI) cortical neurons that respond to vibratory go-cues for wrist movement with the greatest fidelity have their activity modulated just prior to movement onset. This observation fits with the hypothesis that prior to active movement, sensory inputs that are no longer behaviorally relevant are gated so as not to interfere with monitoring movement parameters by the primate CNS. Second, the preliminary results from the recordings from 249 task related sensorimotor cortical neurons indicate that when behavioral conditions become suddenly unpredictable, responsiveness to peripheral sensory and centrally-generated inputs is increased. This is tentatively being

viewed as a release from the tonic attenuation that probably occurs during the performance of stereotypic behaviors. Finally, preliminary findings suggest that human subjects can alter wrist movements toward a positional target if vibratory abort-cues are presented early enough. Correct alterations in movement become more likely with increased practice. Final performance and the time necessary to achieve it range on the order of 4-6 days. DTIC

N94-18242# Oak Ridge National Lab., TN.
MATRIX- AND SUBSTRATE-ASSISTED LASER DESORPTION FOR FAST DNA SEQUENCING
C. H. CHEN, S. L. ALLMAN, K. TANG, and R. B. JONES 1993 8 p Presented at the OE/LASE 1993 International Society for Optical Engineering (SPIE) Conference, Los Angeles, CA, 16-23 Jan. 1993
(Contract DE-AC05-84OR-21400)
(DE93-015332; CONF-930159-37) Avail: CASI HC A02/MF A01

Tremendous effort has been put to achieving fast sequencing of DNA due to the potential great applications in biological and medical research. Current DNA sequencing methods were developed by Sanger and Maxam-Gilbert. Both radioactive methods and fluorescent dye labeling methods for DNA sequencing require the use of the time-consuming gel electrophoresis method. It is desirable to consider a time-of-flight mass spectrometer approach to DNA sequencing since the time needed for separation of DNA segments in a mass spectrometer is a few microseconds instead of a few hours in gel electrophoresis. However, there are two major difficulties: developing a reliable method t deliver these nonvolatile biopolymers to the mass spectrometer's ionization zone, and achieving ion production without significant fragmentation in either the desorption or ionization steps. Electrospray and laser-desorption ionization have been considered to have good potential for overcoming these difficulties. Large polypeptide molecules can be put into the gas phase and ionized by a laser in the presence of excessive amounts of nicotinic acid molecules serving as a matrix, a method called the matrix-assisted laser desorption/ionization (MALDI). Matrix-assisted UV desorption and ionization has also been applied to DNA segments; however, the success has been limited to very small segments. MALDI has been used here for detecting medium sizes of oligomers. Fast sequencing of DNA by laser mass spectrometry can possibly be achieved by discovering new matrices for efficient production of parent ions of large oligomers. Another approach is to achieve efficient post-ionization after the desorption. The first step has been taken, the success may not be very far away. DOE

N94-18305 Hawaii Univ., Manoa.
PHOTOSYNTHETIC RESPONSES TO THE ENVIRONMENT, VOLUME 8 Final Report
HARRY Y. YAMAMOTO and CELIA M. SMITH 27 Aug. 1992 263 p Presented at the Proceedings Symposium, Manoa, HI, 24-27 Aug. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-92-J-1523)
(AD-A269584) Avail: CASI HC A12

Certain fundamental differences separate marine, aquatic, and terrestrial plants as obviously as the difference in physical factors among their habitats. Yet at the core of their responses to environmental factors, photosynthesis ties these entities together in ways not typically seen in scientific meetings or collaboration among researchers. It was our optimistic intent in organizing this meeting 'Photosynthetic Responses to the Environment' to try to bridge these diverse groups of plant life and scientists by bringing together leaders, researchers, and young scientists for three days of in-depth discussions that could refresh us with new appreciation, new ideas, and new colleagues. DTIC

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A94-10376
EUROPEAN WORKSHOP IN AVIATION CARDIOLOGY, 1ST, BROCKET HALL, UNITED KINGDOM, OCT. 10-12, 1991, PROCEEDINGS
MICHAEL JOY, ED. (Civil Aviation Authority, Gatwick, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 181 p. For individual items see A94-10377 to A94-10397
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Topics discussed in this volume include the aviation environment in Europe (aspects of risk); hypertension and vascular risk factors (aspects of epidemiology and strategies for intervention); epidemiology, diagnosis, and intervention in coronary artery disease; cardiomyopathy, ventricular hypertrophy, adult congenital heart disease, and mitral leaflet prolapse; and electrophysiology and pacing (management and strategies). Papers are presented on medical-cause accidents in commercial aviation, cardiovascular risk and risk factors in the context of aircrew certification, epidemiology of hypertension in Europe, strategies for the management of hypertension in aircrew, and pros and cons of lipid screening in aircrew. Attention is also given to the natural history of angiographically demonstrated coronary artery disease, late results following coronary artery bypass grafting, cardiomyopathy and aircrew fitness, ventricular rhythm disturbances in the normal heart, and aviation and antiarrhythmic medication. AIAA

A94-10377
INTRODUCTION AND SUMMARY OF PRINCIPAL CONCLUSIONS TO THE FIRST EUROPEAN WORKSHOP IN AVIATION CARDIOLOGY
MICHAEL JOY (Civil Aviation Authority, Medical Branch, Gatwick, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 1-9. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper describes the activities and substructures of the United Nations Organization known as ICAO and briefly discusses the conclusions reached on the topics examined at the First European Workshop in Aviation Cardiology. Particular attention is given to the discussions of problems of risk and vascular risk factors; the epidemiology of hypertension in Europe; the probability of an incapacitating event; the management strategies for hypertension in aircrew; the epidemiology, diagnosis, and prevention of coronary artery disease; the relationship of left ventricular hypertrophy to cardiovascular event; ventricular rhythm disturbances in the normal heart; and the benefits and shortcomings of various classes of antiarrhythmic agents. AIAA

A94-10378
MEDICAL-CAUSE ACCIDENTS IN COMMERCIAL AVIATION
G. BENNETT (Civil Aviation Authority, Gatwick, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 13-15. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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Pilot's accident rates fall steadily with increasing experiments up to age 60, with a small increase above age 60 (although 65-year-old pilots with normal experience still have a lower accident rate than 45 year old pilots). Thus, it is just as important for flight safety not to remove older and more experienced pilots unnecessarily from the system on medical grounds as to correctly

diagnose and treat a potentially incapacitating cardiovascular (or other medical) problem. The paper discusses three major problems for aviation medicine. These are the primary prevention of cardiovascular disease, the development of the most cost-effective methods for routine screening of allegedly fit pilots for potentially incapacitating conditions, and the identification of pilots with cardiovascular problems who bear a risk of incapacitating event of 1 percent per annum or more and who are unfit for continued (restricted) certification. AIAA

A94-10379
CARDIOVASCULAR RISK AND RISK FACTORS IN THE CONTEXT OF AIRCREW CERTIFICATION
H. TUNSTALL-PEDOE (Dundee Univ., United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 16-20. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper states the case for aircrew certification in terms of absolute risk, arguing the case for a 1 percent per year limit for cardiovascular mortality, equivalent to the average north European male cardiovascular mortality at age 65. The contribution to risk assessment and management of the three major coronary risk factors (blood pressure, smoking, and cholesterol) is examined, and it is shown how their integration into a risk score can be translated into added or subtracted years of the limit age. This approach gives a biological or cardiovascular age for the individual which may be different from their chronological age. The value of the Dundee Coronary Risk-Disk in assessment of individual's coronary risk is discussed. AIAA

A94-10380
CARDIOLOGICAL ASPECTS OF AVIATION SAFETY - THE NEW EUROPEAN PERSPECTIVE
M. JOY (Civil Aviation Authority, Medical Branch, Gatwick, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 21-26. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52
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The paper examines the medical standards adopted by ICAO and provides a list of the ICAO cardiovascular standards. Particular attention is given to the '1 percent rule', defined as the predicted annual medical (cardiological) event rate which, if exceeded should exclude a professional pilot from flying a multicrew aircraft. A 1 percent risk event per annum corresponds with one event per 100 years, or approximately one event per 10 exp 6 h (it is the cardiovascular mortality rate of a male aged 60-65 in the U.K.). It is emphasized that, although the 1 percent rule has proved both practical and workable over a number of years in the U.K., it is not certain how this rule is applicable to long-haul operations involving two pilots only (instead of two pilots and a flight engineer) being currently practiced due to increasing automation and better standards of reliability. It is expected that unification of medical standards for aviation in Europe will take place by 1996. AIAA

A94-10381
DEFINITIONS OF HYPERTENSION IN RELATION TO RISK - THE ROLE OF AMBULATORY MONITORING
J. G. G. LEDINGHAM (Oxford Univ., United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 35-38. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper discusses the definitions of normotension and hypertension, together with problems in assessing the arterial pressure accurately, due to encountered fluctuations in measurements of arterial pressure in normal subjects in all forms of hypertension. It is emphasized that any aircrew found 'hypertensive' by casual sphygmomanometry but without evidence of hypertensive end-organ damage should be further assessed by ambulatory monitoring, with measurements repeated as often as half-hourly throughout the day. It has been shown that ambulatory pressures are substantially lower than casual pressures in around 30 percent of hypertensive subjects. AIAA

A94-10382
STRATEGIES FOR THE MANAGEMENT OF HYPERTENSION IN AIRCREW
H. R. BRUNNER, B. WAEBER, and J. NUSSBERGER (Lausanne Univ. Hospital, Switzerland) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 45-49. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper proposes a management strategy for aircrew who exhibit a consistently elevated blood pressure (after establishing that the pilot's condition is not the case of 'white coat' hypertension and excluding the presence of a cardiovascular disease). It is emphasized that the efficacy of the nonpharmacological therapy (e.g., weight reduction, reduction of sodium intake, vegetarian diet, and exercise) is of dubious value. The different classes of drugs available for the treatment of hypertension (diuretic agents, beta-adrenoceptor blocking agents, slow channel calcium blockers, and angiotensin II converting enzyme inhibitors) are evaluated. Particular attention is given to the drug classes that should be avoided in treatment of pilots. These include the centrally acting drugs (e.g., reserpine, methyldopa, and lipophilic beta-blocking agents) and the alpha-adrenoceptor blocking agents (e.g., phenoxybenzamine and urapidil). AIAA

A94-10383
LIPID SCREENING IN AIRCREW - PROS AND CONS
A. KEECH and P. SLEIGHT (John Radcliffe Hospital, Oxford, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 50-53. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper reviews data on lifestyle, blood cholesterol, and incidence of coronary heart disease (CHD) in general population and determines the relationship among the three factors. Hypertension per se is known to increase CHD risk. It is shown that some changes in lifestyle (such as abandoning smoking and lowering of cholesterol-promoting food in diet) can have a dramatic beneficial effect on the CHD risk. In spite of few reports that benefits of low-lipid diet with respect to CHD risk might be offset by adverse effects on other conditions, the overwhelming evidence is in favor of low-cholesterol diet. Where absolute CHD risk is high, the use of drugs lowering blood chaolesterol is recommended. AIAA

A94-10384
CORONARY ARTERY DISEASE - A EUROPEAN PERSPECTIVE
D. A. CHAMBERLAIN (Royal Sussex County Hospital, Brighton, United Kingdom) and H. TUNSTALL-PEDOE (Dundee Univ., United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 54-58. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The pathophysiology of coronary disease is discussed together with the statistics on the relative risk of mortality from coronary disease in different European countries. It is emphasized that, although the striking differences in coronary death risk existing between European countries cannot be always related to recognized major risk factors, there is one important factor which is usually not taken into consideration, namely, the social class. Only in countries where smoking and the nutritional habits of educated people are not much different from those of the general population, the coronary disease rates are not high. Therefore, the coronary disease rates for aircrew are likely to be more uniform

across Europe than those shown by national mortality rates.
AIAA

A94-10385
WHAT IS THE PREDICTIVE VALUE OF EXERCISE ELECTROCARDIOGRAPHY IN THE INVESTIGATION OF MALE AIRCREW AGED 40-60 YEARS OLD?
J. P. BROUSTET, H. DOUARD, N. OYSEL, P. ROUGIER, and M. KOCH (Bordeaux II, Univ.; Hopital Cardiologique du Haut Leveque, Pessac, France) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 59-69. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The value of exercise electrocardiography as a predictor of fitness of male aircrew is discussed, with particular attention given to the problem of false positive response and the problem of the asymptomatic individual of whatever status in whom an exercise electrocardiogram is abnormal for whatever reason. On the basis of examined evidence, it is suggested that in case of an asymptomatic individual without myocardial infarction, whether or not revascularization has taken place, the subject should be able to complete, off medication, an exercise test exceeding 10 METs (VO2 not less than 35 ml/kg) without significant ventricular ectopic activity, without an ST segment displacement exceeding 2 mm, and with a maximum heart rate as predicted by age. Following myocardial infarction, the same requirements are present, and, once again, coronary angiography is required. In this case, no stenosis greater than 30 percent is to be tolerated other than in the vessel subtending the infarction. AIAA

A94-10386
THE NATURAL HISTORY OF ANGIOGRAPHICALLY DEMONSTRATED CORONARY ARTERY DISEASE
A. V. G. BRUSCHKE, E. E. VAN DER WALL, and V. MANGER CATS (Univ. Hospital, Leiden, Netherlands) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 70-75. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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Follow-up studies of patients with normal coronary arteriograms and normal left ventricular angiograms show that these patients have a good to excellent prognosis irrespective of the clinical picture, whereas patients with signs of mild coronary atherosclerosis (50 to 70 percent arterial lumen diameter narrowing) have less favorable prognosis. Thus, angiographic demonstration of the absence of significant coronary atherosclerosis may prevent unnecessary disqualification of pilots in whom symptoms or noninvasive tests appear to indicate the likelihood of coronary artery disease. On the other hand, in view of the likelihood of progression in all cases with mild coronary artery disease, careful follow-up by annual cardiological review and exercise testing is mandatory, and repeated angiographic evaluations at 5-yr intervals are recommended. AIAA

A94-10387
CORONARY ANGIOPLASTY - LONG-TERM FOLLOW-UP RESULTS AND DETECTION OF RESTENOSIS: GUIDELINES FOR AVIATION CARDIOLOGY - A EUROPEAN VIEW
P. W. SERRUYS and A. BREEMAN (Univ. Hospital Dijkzigt, Rotterdam, Netherlands) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 76-88. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper assesses the effectiveness of percutaneous transluminal coronary angioplasty (PTCA) procedures performed for stable and unstable angina, multivessel/single vessel disease, complete and incomplete revascularization, and such special interventions as saphenous vein bypass graft angioplasty and stenting, using results of long-term (up to 8 yrs) follow-up clinical studies of these subgroups of patients. One such study (Gruentzig et al., 1987) showed that 74 percent of patients, originally candidates for coronary surgery, have been successfully treated without surgery and 67 percent were asymptomatic at the last follow-up study. PTCA is shown to be effective in a wide variety of coronary artery disease subjects and clinical situations. New technologies are being developed, and some, particularly balloon angioplasty of multiple segments, are becoming increasingly frequent. It is noted that, the among various methods for judging the late results following angioplasty, coronary angiography is still the most reliable one. AIAA

A94-10388
LATE RESULTS FOLLOWING CORONARY ARTERY BYPASS GRAFTING
H. J. DARGIE (Western Infirmary, Glasgow, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 89-95. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper presents late follow-up results following coronary artery bypass grafting (CABG), with particular attention given to the relevance of the results for medical aircrew certification. Survival data showed 40, 26, and 20 survival after 20 years of patients with single, double, and triple vessel disease, treated by CABG surgery. In relation to pilot licensing, it is concluded that, for the pilot with normal LV function who does not smoke and who adopts other aspects of a healthy lifestyle, who undergoes a successful CABG procedure (preferably with one or both internal mammary arteries), and who has a normal exercise test postoperatively, the long term future is as secure over the first five years as that of a symptom-free individual of the same age and sex. AIAA

A94-10389
RELATIONSHIP OF LEFT VENTRICULAR HYPERTROPHY TO RISK OF CARDIOVASCULAR EVENTS, AND ITS RELEVANCE TO MEDICAL CERTIFICATION OF AIRCREW
J. T. STEWART (St. George's Hospital, London, United Kingdom) and W. J. MCKENNA (St. Thomas' Hospital, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 96-102. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper discusses the detection, by ECG, of left ventricular hypertrophy (LVH) in asymptomatic individuals, the differentiation of physiological (the athletic heart syndrome) from pathological hypertrophy, and the prognostic implication of LVH in individuals shown to have primary myocardial abnormalities. Particular attention is given to the differentiation between the less than '1-percent-a-year' risk subjects and those with more than 1 percent risk of cardiac event among individuals with hypertrophic cardiomyopathy, seeking pilot certification. It is concluded that, while hypertrophic cardiomyopathy is associated with a risk of sudden incapacity and sudden death, that risk in adults is unrelated to the extent and magnitude of LVH, and, at present, can best be quantified by the presence or absence of nonsustained ventricular tachycardia on ambulatory ECG monitoring. Subjects who have hypertrophic cardiomyopathy without adverse features such as syncope, and who do not have nonsustained ventricular tachycardia or an abnormal blood pressure response to exercise could be considered for restricted Class I certification, subject to annual cardiological review. AIAA

A94-10390
CARDIOMYOPATHY AND AIRCREW FITNESS
Y. GROSGOGEAT (La Salpetriere, Paris, France) and M. M. WEBB-PEPLOE (St. Thomas' Hospital, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 103-110. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991,

Proceedings. A94-10376 01-52 refs
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The clinical identification and prognosis of the commonest forms of primary cardiomyopathy observed in temperate climate are reviewed. These forms include dilated cardiomyopathy, hypertrophic cardiomyopathy, and arrhythmogenic right ventricular dysplasia; the most common type of secondary cardiomyopathy in the western world, alcoholic cardiomyopathy, is also discussed. These conditions are characterized by diagnostic problems in the early stages of the disease and by the frequency of arrhythmias. Procedures for the selection of aircrew candidates are recommended. It is emphasized that the florid form of dilated cardiomyopathy with significant ventricular dilation and marked global hypokinesia constitutes an absolute contraindication to medical certification of aircrew candidates even when it is asymptomatic and without any documented cardiac arrhythmia. AIAA

A94-10391
ADULT CONGENITAL HEART DISEASE WITH SPECIAL REFERENCE TO THE DATA ON LONG-TERM FOLLOW-UP OF PATIENTS SURVIVING TO ADULTHOOD WITH OR WITHOUT SURGICAL CORRECTION

J. E. DEANFIELD (Hospital for Sick Children, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 111-116. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper reviews current recommendations regarding fitness to fly and discussed appropriate strategies for monitoring progress in the light of the new information on follow-up and changes in medical practice. The conditions with an event rate less than 1 percent per annum for multicrew flight, as established by the second U.K. Workshop in Aviation Cardiology, are examined. It is noted that, for many conditions, the information required to make appropriate judgments is currently not available. For instance, in the future, licensing may be appropriate for individuals with complete transposition who have undergone a successful arterial switch procedure; on the other hand, many congenital heart conditions which are now compatible with long-term survival into adult life still bear too great a risk of complicating event, to be considered for commercial pilot licensing. Cardiac conditions which are potentially compatible with certification to fly are given. AIAA

A94-10392
MITRAL LEAFLET PROLAPSE - ASPECTS OF FITNESS TO FLY

M. M. WEBB-PEPLOE (St. Thomas' Hospital, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 117-129. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper discusses the aetiology, pathology, diagnosis, and prevalence of the mitral leaflet prolapse (MLP) condition (defined here as prolapse of part or all of one or both of the mitral valve cusps superiorly towards the left atrium during systole), which can potentially become a cause of sudden death, cerebral embolic events, or endocarditis. Particular attention is given to the natural history and complications of the MLP, and possible MLP screening strategies. A scheme is suggested for the investigation and management of aircrew suspected of having MLP. It is suggested that the following conditions should disqualify an aircrew candidate from certification: thickened redundant mitral leaflets, an end-diastolic LV dimension greater than 60 mm, significant mitral regurgitation, evidence of an intracardiac source of cerebral emboli, and/or abnormal CT brain scan. AIAA

A94-10393
SINO-ATRIAL NODE DYSFUNCTION, ATRIOVENTRICULAR BLOCK AND INTRAVENTRICULAR CONDUCTION DISTURBANCES

E. ROWLAND (St. George's Hospital, London, United Kingdom) and F. MORGADO (Royal Brompton National Heart & Lung Hospital, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 130-135. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper examines various aspects of the natural history of asymptomatic subjects with electrocardiographic manifestations of sino-atrial node dysfunction, first and second atrioventricular block, and intraventricular block. Particular attention is given to the conditions relevant to aviation safety, their diagnosis, and their occurrence among USAF personnel. AIAA

A94-10394
IMPLICATIONS OF LONE ATRIAL FIBRILLATION/FLUTTER IN THE CONTEXT OF CARDIOVASCULAR FITNESS TO FLY

H. E. KULBERTUS (Centre Hospitalier Universitaire, Liege, Belgium) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 136-138. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The paper reviews the results of population studies and clinical findings related to the nature of the condition known as lone atrial fibrillation (i.e., when atrial fibrillation is observed in the absence of any other clinical evidence to suggest a primary cardiac disorder). The three types of lone atrial fibrillation (as an isolated episode, as a paroxysmal disorder, or as a sustained chronic arrhythmia) are described, together with the prognosis for each type and aeromedical implications. It is concluded that only individuals with a normal heart who suffered a single isolated episode of atrial fibrillation precipitated by a reversible event, in whom recovery is complete, may be reconsidered for unrestricted flying duties, after six months of being grounded followed by one year of flying as/with co-pilot, under condition that no abnormalities will occur during this period (as judged by exercise ECG and 2D echocardiography tests and repeated Holter recordings). AIAA

A94-10395
VENTRICULAR RHYTHM DISTURBANCES IN THE NORMAL HEART

R. W. F. CAMPBELL (Freeman Hospital, Newcastle upon Tyne, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 139-143. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 Research supported by British Heart Foundation refs
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The definition, symptoms, and prognostic implications of the three types of ventricular arrhythmias (ventricular fibrillation, torsade de pointes, and ventricular tachycardia) occurring in the normal heart are discussed. Particular attention is given to the possible pathological causes of ventricular ectopic beats and ventricular tachycardia. An algorithm is presented for the investigation and management of individuals with two or more ventricular ectopic beats, as well as an algorithm for individuals with ventricular tachycardia (three or more consecutive ventricular ectopic beats at a rate of 120 beats/min or more). AIAA

A94-10396
AVIATION AND ANTIARRHYTHMIC MEDICATION

A. P. M. GORGELS, H. J. J. WELLENS, and M. A. VOS (Univ. Hospital, Maastricht, Netherlands) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 144-148. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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A number of antiarrhytmic drugs have been reported to have a proarrhythmic potential, both by impairing impulse formation and conduction (bradycardias) and by enhancing ectopic impulse

formation (tachycardias). In this paper, cardiac arrhythmias are classified and an approach is presented to the documentation of the patient's arrhythmia and study of its causes. Antiarrhythmic drugs suitable for treatment of pilots are reviewed, with special attention given to the action of the particular drug, and the management of antiarrhythmic drug prescription is described. It is concluded that antiarrhythmic drug therapy in aviation is possible only in the absence of organic heart disease, and under conditions that arrhythmia is well tolerated physically and mentally and the prescribed drug is sufficiently effective without proarrhythmic and cardiac or extracardiac side effects. AIAA

A94-10397
VENTRICULAR PRE-EXCITATION AND PROFESSIONAL AIRCREW LICENSING
W. D. TOFF (Royal Free Hospital, London, United Kingdom) and A. J. CAMM (St. George's Hospital, London, United Kingdom) European Heart Journal (ISSN 0195-668X) vol. 13, Supplement H Dec. 1992 p. 149-161. European Workshop in Aviation Cardiology, 1st, Brocket Hall, United Kingdom, Oct. 10-12, 1991, Proceedings. A94-10376 01-52 refs
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The condition known as ventricular preexcitation is defined along with the anatomical causes of preexcitation. Consideration is given to the natural history of preexcitation syndromes, the associated heart disease, the diagnosis, and the preexcitation patterns and associated arrhythmia. Particular attention is given to the assessment of subjects with preexcitation, the relationship between the electrocardiographic variables and clinical symptoms, the noninvasive and invasive studies of the ventricular preexcitation syndromes, and the treatment and implications. Two investigative algorithms (a Wolff-Parkinson-White (WPW) and a non-WPW) are presented together with detailed recommendations concerning aircrew licensing. AIAA

A94-10505
FLYING AFTER DIVING AND DECOMPRESSION SICKNESS
R. D. VANN, P. DENOBLE, M. N. EMMERMAN, and K. S. CORSON (Duke Univ., Durham, NC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 801-807. refs
Copyright

Reports of 1,159 decompression sickness (DCS) incidents during recreational diving were analyzed by logistic regression for the effects of flying on the occurrence of Type II DCS, complete relief of symptoms after one recompression, and residual symptoms 3 mo after treatment. The relevant diver populations were those who: (1) did not fly; (2) had symptoms before flying but flew anyhow; (3) and did not have symptoms before flying but developed symptoms during or after flight. Symptoms which occurred during or after flight were no more serious and their responses to recompression no less successful than symptoms in nonflying divers. There was a statistically significant association between divers who flew with preexisting symptoms and Type II DCS, incomplete relief with one recompression, and residual symptoms after 3 mo. Author (revised)

A94-10506* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BREATHING 100 PERCENT OXYGEN COMPARED WITH 50 PERCENT OXYGEN:50 PERCENT NITROGEN REDUCES ALTITUDE-INDUCED VENOUS GAS EMBOLI
JAMES T. WEBB (Krug Life Sciences, Inc., San Antonio, TX) and ANDREW A. PILMANIS (USAF, Armstrong Lab., Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 808-812. refs
(Contract F33615-89-C-0603; F33615-92-C-0018; NASA ORDER T-82170)
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The study investigates effects of 40 zero-prebreathe decompressions of male subjects to 8.3-6.8 psia for 6 h while they were breathing 100 percent oxygen and performing moderate exercise. No decompression sickness (DCS) symptoms were observed. Severe venous gas emboli (VGE) were not detected at 8.3 psia, but were present during 10, 20, and 40 percent of the exposures at 7.8, 7.3, and 6.8 psia, respectively. Zero-prebreathe decompression while breathing 100 percent oxygen results in significantly lower VGE and DCS risk levels than while breathing a 50:50 mix. It is shown that 7.3 psia EVA pressure suits with 100 percent oxygen should be safer than 8.3 psia suits with a 50:50 mix. AIAA

A94-10507* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AUTONOMIC PHYSIOLOGICAL DATA ASSOCIATED WITH SIMULATOR DISCOMFORT
JAMES C. MILLER, THOMAS J. SHARKEY, GLENNA A. GRAHAM, and MICHAEL G. MCCAULEY (Monterey Technologies, Inc., Cary, NC; U.S. Army; NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 813-819. Research supported by U.S. Army refs
(Contract NAS2-12927)
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A physiological monitoring capability was developed for the Army's Crew Station Research and Development Facility (CSRDF), a research simulator for advanced rotorcraft. Preliminary physiological data are reported from studies of simulator-induced sickness. Our objective was to demonstrate sensitivity of physiological measures relative to self-reports of simulator sickness severity. The data suggested that heart period, tachygastria, and skin conductance level were more sensitive to simulator sickness than were vagal tone and normal myoelectrical gastric activity.

A94-10508* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CHANGES IN COMPENSATORY EYE MOVEMENTS ASSOCIATED WITH SIMULATED STIMULUS CONDITIONS OF SPACEFLIGHT
DEBORAH L. HARM, LINDA M. ZOGRAFOS, NOEL C. SKINNER (NASA, Johnson Space Center, Houston, TX), and DONALD E. PARKER (Miami Univ., Oxford, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 820-826. refs
(Contract NAS9-17720; NAS9-17413)
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Compensatory vertical eye movement gain (CVEMG) was recorded during pitch oscillation in darkness before, during, and immediately after exposures to the stimulus rearrangement produced by the Preflight Adaptation Trainer (PAT) Tilt-Translation Device (TTD). The TTD is designed to elicit adaptive responses that are similar to those observed in microgravity-adapted astronauts. The data from Experiment 1 yielded a statistically significant CVEMG decrease following 15 min of exposure to a stimulus rearrangement condition where the phase angle between subject pitch tilt and visual scene translation was 270 deg; statistically significant gain decreases were not observed following exposures either to a condition where the phase angle between subject pitch and scene translation was 90 deg or to a no-stimulus-rearrangement condition. Experiment 2 replicated the 270-deg-phase condition from Experiment 1 and extended the exposure duration from 30 to 45 min. Statistically significant additional changes in CVEMG associated with the increased exposure duration were not observed. The adaptation time constant estimated fram the combined data from Experiments 1 and 2 was 29 min. Author (revised)

A94-10509* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CHINESE HYPER-SUSCEPTIBILITY TO VECTION-INDUCED MOTION SICKNESS
ROBERT M. STERN, SENQI HU, REE LEBLANC, and KENNETH L. KOCH (Pennsylvania State Univ., University Park and Hershey) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 827-830. Research supported by

NSF refs
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Little is known about the factors that control individual differences in susceptible to motion sickness. A serendipitous observation in our laboratory that most Chinese subjects become motion sick prompted this study. We used a rotating optokinetic drum to provoke motion sickness and compared gastric responses and symptom reports of Chinese, European-American, and African-American subjects. There was no difference in the responses of European-American and African-American subjects; however, Chinese subjects showed significantly greater disturbances in gastric activity and reported significantly more severe symptoms. We suggest that this hypersusceptibility presents a natural model for the study of physiological mechanisms of nausea and other symptoms of motion sickness.

Author (revised)

A94-10510
SALT LOADING TEST IN A POPULATION ADAPTED TO MODERATELY HIGH ALTITUDE LIVING (3,000 M)

GERMAN RAMIREZ, POLLY A. BITTLE, STEVEN J. AGOSTI, JOHN DIETZ (USVA, James A. Haley Hospital; South Florida Univ., Tampa, FL), and GENE L. COLICE (Dartmouth Medical School; VAM & ROC, White River Junction, VT) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 831-838. Research supported by American Heart Association refs
(Contract NIH-HL-37235)
Copyright

The sodium excretory capacity of normal subjects acutely mobilized from sea level to moderately high altitude was compared to native subjects adapted to high altitude living (3,000 m). This study was conducted in order to provide insights into hormonal adaptations associated with acute mobilization to a hypoxemic environment and to try to determine how these variables could influence the renal handling of a salt load. A standard amount of 5 percent NaCl solution at a volume of 100 ml/sq m BSA was infused over a 30-min period to all subjects. Urine collections were obtained periodically over the next 3 h. Subjects adapted to moderately high altitude living were able to excrete a salt load faster than unadapted subjects (57.1 vs. 32.9 mmol sq m h, respectively). No change in plasma atrial natriuretic factor concentration in either group of subjects was observed during the salt administration period. Adapted individuals had significantly higher baseline levels of antidiuretic hormone (ADH). The high altitude natives enhanced excretory response to a salt load was not explained by any observed hormonal changes, and their lack of increased ADH release to serum osmolar changes was unexplained.

Author (revised)

A94-10513
AIRCREW FATIGUE DURING DESERT SHIELD C-5 TRANSPORT OPERATIONS

ROGER U. BISSON, TERENCE J. LYONS, and CHARLES HATSEL (USAF, Armstrong Lab., Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 848-853. refs
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The metrics used to define U.S. Air Force crew rest and flight duty limitations were not designed to manage surge operations such as Operation Desert Shield. Desert Shield provided an opportunity to obtain inflight data on acute and cumulative fatigue and the effect of other stressors during over-the-shoulder observations on 24 C-5 airlift crew members. Findings emphasize how sleep history, recent duty day cycles, subjective fatigue, scheduling patterns, nutrition, and billeting facilities contribute to fatigue and lower levels of alertness. The results of this fairly insignificant observational study attempt to preserve some of the aeromedical lessons of Desert Shield. The flight surgeon authors integrate their experience to outline development of a fatigue management and alertness enhancement doctrine.

Author (revised)

A94-10515
THE OXYGEN WINDOW AND DECOMPRESSION BUBBLES - ESTIMATES AND SIGNIFICANCE

HUGH D. VAN LIEW, JOHNNY CONKIN, and MARK E. BURKARD (New York State Univ., Buffalo) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 859-865. refs
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The 'oxygen window' causes a partial pressure difference of inert gas between the inside and outside of decompression bubbles. Estimates of P(O2) and P(CO2) in tissue are necessary for O2 window calculations and any calculations about growth or decay of decompression sickness bubbles, but the estimates involve many uncertainties. Using simplifying assumptions, we estimated the O2 window over a broad range of environments for tissues having a wide range of O2 extractions. The results were as follows: a) the window increases with ambient pressure, but levels off at very high pressure; b) the window is only 1 or 2 kPa for air breathing at extreme altitudes, and 200 kPa or more in hyperbaric environments; c) when O2 is breathed instead of air, the window is as much as 50 times larger at altitude but only about 10 times larger in hyperbaric environments; d) changes in bubble size due to the window decrease as barometric pressure increases; and e) there are seven additional factors which may supplement or oppose the action of the oxygen window.

Author (revised)

A94-11094
MAXIMAL LACTIC CAPACITY AT ALTITUDE - EFFECT OF BICARBONATE LOADING

BENGT KAYSER, GUIDO FERRETTI, BRUNO GRASSI, TIZIANO BINZONI, and PAOLO CERRETELLI (Centre Medical Universitaire, Geneva, Switzerland) Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1070-1074. Research supported by Italian Ev-K2 Scientific Committee and Swiss National Sports Council refs
Copyright

The hypothesis that the net maximal blood lactate accumulation, La(max), during heavy exercise in lowlanders acclimatized to chronic hypoxia may be limited by the reduced bicarbonate stores was tested in experiments where six subjects performed supramaximal exercise until voluntary exhaustion at sea level and after sojourning for one month at 5050 m with and without oral NaHCO3 loading. Measurements of exhaustion time, arterial blood lactate concentration, arterial pH, arterial P(CO2), and intramuscular pH at rest and after exercise were used as indices of the effect of bicarbonate loading. The results showed no increase in La(max) values after bicarbonate loading in altitude-acclimatized subjects. It was also found that muscle pH after exhaustive exercise was higher at altitude than at sea level.

AIAA

A94-11095
SEA-LEVEL P(CO2) RELATES TO VENTILATORY ACCLIMATIZATION AT 4,300 M

JOHN T. REEVES, ROBERT E. MCCULLOUGH, LORNA G. MOORE, ALLEN CYMERMAN, and JOHN V. WEIL (Colorado Univ., Denver; U.S. Army, Research Inst. of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1117-1122. refs
(Contract DAMD81-C-1057; DAMD17-91-C-1112; NIH-HL-14985)
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The hypothesis of Hirshman et al. (1978) and Weil (1986) that the large (over an eightfold range) individual variations in the strength of the hypoxic ventilatory response (HVR) observed in the laboratory are related to ventilatory acclimatization to altitude was tested. End-tidal P(CO2) values were measured in 37 resting subjects at sea level (showing a 34-48 Torr range) and after the subjects were taken to Pikes Peak (4300 m), with measurements made on arrival and repeatedly over 19 days. It was found that, at 4300 m, subjects with high end-tidal P(CO2) had low values of arterial oxygen saturation, Sa(O2), and that sea-level end-tidal P(CO2) related to Sa(O2) after 19 days at 4300 m. The end-tidal P(CO2) values on arrival and after 19 days at 4300 m were inversely related to the sea-level HVR values.

AIAA

A94-11096
EFFECTS OF ALTITUDE ACCLIMATIZATION ON FLUID REGULATORY HORMONE RESPONSE TO SUBMAXIMAL EXERCISE
PAUL B. ROCK, WILLIAM J. KRAEMER, CHARLES S. FULCO, LAURIE A. TRAD, MARK K. MALCONIAN, MADELEINE S. ROSE, PATRICIA M. YOUNG, and ALLEN CYMERMAN (U.S. Army, Research Inst. of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1208-1215. refs
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The effect of altitude acclimatization on plasma levels of atrial natriuretic peptide (ANP) during submaximal exercise and the relationship between acclimatization and the plasma renin activity (PRA) and aldosterone (ALDO) were studied in seven male subjects exercised to exhaustion on a bicycle ergometer at sea level (SL, 50 m), during 1 h in a hypobaric chamber (acute altitude (AA) 4300 m), and after 14-16 days of residence on the summit of Pikes Peak (chronic altitude (CA) 4300 m). The levels of ANP in blood plasma were found to progressively increase from rest to postexercise at SL and AA, but not at CA. Both PRA and ALDO also rose from rest to postexercise, but the rise in ALDO with exercise was less during AA than during SL and CA. The fact that the ANP levels decreased during exercise after altitude acclimatization, with no change in PRA and ALDO, indicates that ANP has little effect on PRA and ALDO under altitude acclimatization. AIAA

A94-11098
TISSUE GAS STORES OF THE BODY AND HEAD-OUT IMMERSION IN HUMANS
MATS H. LINER (Karolinska Inst., Stockholm, Sweden) Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1285-1293. Research supported by Swedish Medical Research Council and Karolinska Inst refs
Copyright

Breath-by-breath gas exchange was studied in 10 subjects during and after transitions between dry conditions and head-out immersion in thermoneutral conditions. Cardiac index (CI) was estimated by means of impedance cardiography. An increase in CI by 47.0 percent during immersion was associated with an increase in the tissue O2 stores by 122 ml/sq m and a decrease in the tissue CO2 stores by 148 ml/sq m. The time constants for the recovery of O2 uptake (tauO2) and CO2 elimination after initial increases after the dry-to-immersion transition were 32.4 and 79.3 s, respectively. The decrease in CI on return to the dry conditions was associated with a drop in tissue O2 stores and a tauO2 of 144 s. The increase in tissue O2 stores during immersion as well as the difference in tauO2 between the two transitions were larger than could be explained by the change in CI only. This was attributed to changes in the distributions of peripheral blood flow and venous blood volume. Compared with the O2 stores, the decrease in CO2 stores was better predicted by the change in CI. The present results emphasize that the changes in pulmonary and tissue gas exchange imposed by head-out immersion transients mainly reflect movement of gas in and out of body stores.
Author (revised)

A94-11139* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AMBULATORY BLOOD PRESSURE AND HEART RATE DURING SHUTTLE FLIGHT, ENTRY AND LANDING
W. THORNTON (NASA, Johnson Space Center, Houston, TX), T. P. MOORE (Minnesota Univ., Minneapolis), and J. URI (NASA, Johnson Space Center, Houston, TX) Oct. 1993 6 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-127)

Ambulatory blood pressures (BP) and heart rates (HR) were recorded on a series of early Shuttle flights during preflight and pre-entry, entry, landing and egress. There were no significant differences between flight and preflight values during routine activity. Systolic blood pressure was slightly elevated in the deorbit period and systolic and diastolic blood pressure and heart rates were all elevated with onset of gravitoinertial loads and remained so through egress. Two of seven subjects had orthostatic problems in egress but their data did not show significant differences from others except in heart rate. Comparison of this data to that from recent studies show even larger increase in HR/BP values during current deorbit and entry phases which is consistent with increased heat and weight loads imposed by added survival gear. Both value and limitations of ambulatory heart rate/blood pressure data in this situation are demonstrated.

A94-11140
PHLEBOLOGIC-DYNAMIC CHANGES IN HUMAN DURING MICROGRAVITY
MR. PURUHITO (Airlangga Univ., Surabaya, Indonesia) Oct. 1993 6 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-128) Copyright

Phlebologic-dynamic behavior of human under microgravity conditions is studied. It is hypothesized that during microgravity there will be a different pattern of venous flow and dynamic characters in human phlebology, which could lead to an applied meaning in the treatment of phlebologic disorders. Hemodynamic parameters were calculated using the standard medical-physics formula for phlebology and blood circulations. Emphasis is placed on the anatomical situation of the venous system of legs. Hemodynamic formulas used to explain the changes of venous flow show a different pattern of flow dynamics of venous circulation under 0 g condition. AIAA

A94-11141* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
UP-DOWN ASYMMETRY OF VERTICAL OPTOKINETIC NYSTAGMUS AND AFTER-NYSTAGMUS ELICITED IN MICROGRAVITY
GILLES CLEMENT (CNRS, Lab. de Physiologie Neurosensorielle, Paris, France), CORINNA E. LATHAN (MIT, Cambridge, MA), and ALAIN BERTHOZ (CNRS, Lab. de Physiologie Neurosensorielle, Paris, France) Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by CNRS and CNES refs
(Contract NAS9-17267)
(IAF PAPER 93-132) Copyright

Vertical optokinetic nystagmus (OKN) and optokinetic after-nystagmus (OKAN) studied in 4 subjects during parabolic flights were compared with data obtained on 2 subjects before, during, and after a 7-day space shuttle flight. In parabolic flight, the vertical OKAN following upgoing optokinetic stimulation increased during the 0 g phase, and decreased during the 1.8 g phase. In spaceflight, the vertical OKN gain asymmetry showed a reversal during early exposure to microgravity. This asymmetry reversal is likely the same effect seen in parabolic flight and could be a direct response to the change in otolithic output. However, if asymmetry changes were due only to the otolithic sensory input, we would also expect large changes upon return to normal gravity. Instead, there were large OKN and OKAN changes at the beginning of the flight, but the deviation from the original vertical OKN gain asymmetry constantly decreased throughout the flight and continued post-flight until pre-flight asymmetry value was restored. This suggests one adaptive goal which reinstates the original pre-flight gain and asymmetry value regardless of changing inputs. This adaptation resembles mechanisms seen in posture experiments where the motor programs on Earth are reinstated in microgravity after a period of adjustment.

A94-11142* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TRAPPED BELT VARIATIONS AND THEIR EFFECTS ON HUMAN SPACE FLIGHTS
DONALD E. ROBBINS and GAUTAM D. BADHWAR (NASA, Johnson Space Center, Houston, TX) Oct. 1993 11 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct.

16-22, 1993 refs
(IAF PAPER 93-137)

Variations in the Earth's trapped (Van Allen) belts produced by solar flare particle events are not well understood. This paper reports the existence of a second proton belt and its subsequent decay as measured by a tissue-equivalent proportional counter and a particle spectrometer on five Space Shuttle flights covering an 18-month period. The creation of this second belt is attributed to the injection of particles from a solar particle event which occurred at 2246 UT, March 22, 1991. Comparisons with observations onboard the Russian Mir space station and other unmanned satellites are made. Shuttle measurements and data from other spacecraft are used to determine that the e-folding time of the peak of the second proton belt was ten months. Proton populations in the second belt returned to values of quiescent times within 18 months. The increase in absorbed dose attributed to protons in the second belt was approximately 20 percent. Passive dosimeter measurements were in good agreement with this value. Author (revised)

N94-10398* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 375)
May 1993 83 p
(NASA-SP-7011(375); NAS 1.21:7011(375)) Avail: CASI HC A05

This bibliography lists 212 reports, articles, and other documents recently introduced into the NASA Scientific and Technical Information System database. Subject coverage includes the following: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author (revised)

N94-10399* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 376)
Jun. 1993 89 p
(NASA-SP-7011(376); NAS 1.21:7011(376)) Avail: CASI HC A05

This bibliography lists 265 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Jun. 1993. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N94-10795# Boeing Co., Seattle, WA.
HEALTH AND SAFETY ISSUES FOR AEROSPACE WORKERS IN THE USE OF ADVANCED MATERIALS
JAMES M. PETERSON and WILFRID L. CAMERON (International Association of Machinists and Aerospace Workers, Washington, DC.) *In* FAA, Proceedings of the International Conference for the Promotion of Advanced Fire Resistant Aircraft Interior Materials p 339-344 Mar. 1993
Avail: CASI HC A02/MF A03

The Boeing Company is committed to providing a safe and healthy working environment for its employees. Furthermore, the Company is committed to the well-being of communities in which the employees live and work. Wherever possible, hazardous materials and processes in the work place are being substituted with less hazardous materials and processes in the manufacture of aircraft. This change of substituting materials and processes must be achieved efficiently and cost effectively. Author

N94-10813# Federal Aviation Agency, Oklahoma City, OK. Civil Aeromedical Inst.
AVIATION ACCIDENT RISK FOR AIRMEN WITH APHAKIA AND ARTIFICIAL LENS IMPLANTS Final Report
VAN B. NAKAGAWARA and KATHRYN J. WOOD Jul. 1993 15 p
(DOT/FAA/AM-93/11; AD-A268226) Avail: CASI HC A03/MF A01

Airmen with aphakia and intraocular (IOL) implants who, on a case-by-case basis, may obtain a waiver for a medical certificate, have been previously associated with higher aviation accident rates when compared to the total civil airman population. This study analyzes the accident frequencies of these civil airmen for a 4-year period (1982-85). Medical records were evaluated for all certified airmen who carried FAA-specific pathology codes for aphakia and artificial lens implants during the study period. Aviation accident and active airman population frequencies were obtained from FAA databases. The entire population of aphakia and IOL airmen and those less than 50 years of age had significantly higher (p less than .50) accident rates than the corresponding non-aphakic airman population. Aeromedical certification considerations of the study findings are discussed. Further investigations into additional confounding factors between the aphakic and non-aphakic populations are recommended. Author

N94-10828 National Inst. of Health, Bethesda, MD.
NATIONAL INSTITUTE OF HEALTH ALMANAC, 1992 Annual Report
Nov. 1992 148 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-183556; NIH-PUB-92-5) Avail: Issuing Activity (National Technical Information Service (NTIS))

This report, which is published annually, presents pertinent facts about the National Institutes of Health--the Federal Government's principal biomedical research agency. It is designed as a ready reference source on the NIH's 13 research Institutes and 2 Divisions, the National Library of Medicine, the Clinical Center--a combined research hospital and laboratory complex--the National Center of Nursing Research, the National Center for Research Resources, and the John E. Fogarty International Center for Advanced Study in the Health Sciences. NTIS

N94-10872# Society for Research on Biological Rhythms, Charlottesville, VA.
THE 2ND ANNUAL MEETING OF THE SOCIETY FOR RESEARCH ON BIOLOGICAL RHYTHMS Final Report, 1 Mar. 1992 - 1 Mar. 1993
FRED W. TUREK (Northwestern Univ., Evanston, IL.) 30 Apr. 1993 121 p Meeting held in Jacksonville, FL, 9-13 May 1990
(Contract F49620-92-J-0181)
(AD-A264869; AFOSR-93-0345TR) Avail: CASI HC A06/MF A02

From 6-10 May 1992, the Society for Research on Biological Rhythms held its third meeting at Amelia Island Plantation, Florida. The Society was formed in 1987 to promote the advancement of basic and applied research in all aspects of biological rhythms, to disseminate important research results concerning biological rhythms to the general public, to develop and enhance the education and training of students and researchers in the field, and to foster interdisciplinary communication. This third meeting was successful in meeting the goals of the Society, particularly in the area of interdisciplinary communication. Researchers in the field of Biological Rhythms tend to be fragmented into many disciplines and are often divided along many different lines. One way of dividing the field is along frequency lines; while some workers study biological rhythms with a period of msec, others are interested in rhythms with periods in the range of minutes, hours (i.e. ultradian or pulsatile), a day (i.e. circadian), or a year (i.e. seasonal or circannual). The field is also divided along the lines of the major disciplines within biology since rhythms biologists can be either biochemists, molecular/cellular biologists, system physiologists, behaviorists, or ecologists. In addition, while many workers study the basic biological mechanisms involved in generating rhythmicity, others are interested in the clinical applications of a better understanding of biological rhythmicity. Even within the clinical field, researchers fall into many traditional categories including psychiatry, endocrinology, neurology, oncology, cardiology, and reproduction. DTIC

N94-11097# Naval Aerospace Medical Research Lab., Pensacola, FL.

MOTION AND SPATIAL DISORIENTATION SYSTEMS: SPECIAL RESEARCH CAPABILITIES Special Report

A. H. RUPERT and R. E. GADOLIN Apr. 1993 57 p

(AD-A265155; NAMRL-SR93-1) Avail: CASI HC A04/MF A01

The wide variety of unique devices together with the scientists and technicians who operate them have enabled the Naval Aerospace Medical Research Laboratory (NAMRL) to develop an international reputation as a center of excellence in vestibular research and the dynamics of spatial orientation, and for training outstanding scientists who are engaged in basic research worldwide. This document contains a brief description of the man-rated acceleration research facilities of the United States Navy. DTIC

N94-11224# Science Applications International Corp., Joppa, MD.

P2NBC2 HEAT STRAIN DECISION AID. USER'S GUIDE, VERSION 2.1

Apr. 1993 51 p

(Contract DAAL02-90-C-0071)

(AD-A266072) Avail: CASI HC A04/MF A01

This report describes the capabilities and proper use of the P2NBC2 Heat Strain Decision Aid Software System. The P2NBC2 HSDA is a stand alone analytical tool for evaluating the effects of heat stress on soldier performance limits. User inputs include clothing type/chemical protective posture, activity level based on military task type, soldier anthropometric characteristics and acclimatization status, and environmental conditions (air temperature, wind speed, humidity, and solar radiation). The P2NBC2 HSDA provides color graphics, tabular, and data file outputs for heat casualty risk, sustainable work/rest cycle limits, maximum safe work time, and associated drinking water requirements. DTIC

N94-11261# Brown Univ., Providence, RI.

THREE-DIMENSIONAL OBJECT RECOGNITION USING AN UNUSPERVISED BCM NETWORK: THE USEFULNESS OF DISTINGUISHING FEATURES

NATHAN INTRATOR and JOSHUS I. GOLD 17 May 1993 13 p

(Contract N00014-91-J-1316)

(AD-A264576; TR-65-ONR) Avail: CASI HC A03/MF A01

We propose an object recognition scheme based on a method for feature extraction from gray level images that corresponds to recent statistical theory, called projection pursuit, and is derived from a biological motivated feature extracting neuron. To evaluate the performance of this method we use a set of very detailed psychophysical 3D object recognition experiments. DTIC

N94-11449# Tristan Technologies, Inc., San Diego, CA.

LARGE ARRAY SQUID MAGNETOMETER FOR NDE Annual Report, 1 Apr. 1992 - 1993

DOUGLAS N. PAULSON 27 Apr. 1993 16 p

(Contract F49620-92-C-0026)

(AD-A264799; AFOSR-93-0348TR) Avail: CASI HC A03/MF A01

Tristan Technologies, Inc. is working to apply SQUID magnetometry to problems in nondestructive evaluation which are important to the Strategic Defense Initiative. We have designed and are nearing completion of an innovative Non Destructive Evaluation (NDE) instrument that, unlike most existing instruments, can be used for studying deep sources with applied fields. We will assess the effectiveness of this SQUID NDE system for a broad range of nondestructive evaluation problems related to high-performance aircraft bearings, nuclear reactor fuel tubes, titanium billets for aircraft turbine blades, high-temperature superconducting magnetic shields, and riveted joints in military and commercial aircraft. In various applications, SQUID magnetometers could facilitate the development of high-performance devices, reduce manufacturing costs, monitor performance and assure quality control in manufacturing, and help prevent catastrophic failures of aircraft, satellites, weapons and other military systems. During Phase 3 we will design and commercialize instruments specifically to meet the most promising NDE applications for SQUID magnetometers. DTIC

N94-11542*# Space Biomedical Research Inst., Houston, TX. Environmental Physiology/Biophysics Section.

JOINT PAIN AND DOPPLER-DETECTABLE BUBBLES IN ALTITUDE (HYPOBARIC) DECOMPRESSION Abstract Only

MICHAEL R. POWELL *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 546 Feb. 1993

Avail: CASI HC A01/MF A03

The observation that altitude decompression sickness (DCS) is associated with pain in the lower extremities is not new, although it is not a consistent finding. DCS in divers is generally in the upper body, an effect often attributed to non-loading of the body while immersed. In caisson workers, DCS is reported more in the lower extremities. Surprisingly, many researchers do not mention the location of DCS joint pain, apparently considering it to be random. This is not the case for the tissue ratios encountered in studying decompression associated with simulated EVA. In NASA/JSC tests, altitude DCS generally presented first in either the ankle, knee, or hip (83 percent = 73/88). There was a definite statistical relation between the maximum Spencer precordial Doppler Grade and the incidence of DCS in the extremity, although this is not meant to imply a casual relation between circulating gas bubbles and joint pain. The risk of DCS with Grade 4 was considerably higher than that of Grades 0 to 3. The DCS risk was independent of the 'tissue ratio.' There was a predominance of lower extremity DCS even when exercise was performed with the upper body. The reason for these locations we hypothesize to be attributed to the formation of tissue gas micronuclei from kinetic and tensile forces (stress-assisted nucleation) and are the result of the individuals ambulating in a 1g environment. Additionally, since these showers of Doppler bubbles can persist for hours, it is difficult to imagine that they are emanating solely from tendons and ligaments, the supposed site of joint pain. This follows from Henry's law linking the volume of joint tissue (the solvent) and the solubility coefficient of inert gas; there is volumetrically insufficient connective tissue to produce the prolonged release of gas bubbles. If gas bubbles are spawned and released from connective tissue, their volume is increased by those from muscle tissue. Therefore, the nexus between Doppler-detectable gas bubbles and joint-pain decompression sickness is essentially a statistical, rather than a direct, one. Author (revised)

N94-11543*# Aerospace Medical Research Labs., Brooks AFB, TX.

ARTERIAL GAS EMBOLI IN ALTITUDE-INDUCED DECOMPRESSION SICKNESS Abstract Only

ANDREW A. PILMANIS and ROBERT M. OLSON (Krug Life Sciences, Inc., San Antonio, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 547 Feb. 1993

Avail: CASI HC A01/MF A03

Exposure to high altitudes can result in the evolved-gas condition referred to as decompression sickness (DCS). Ultrasonic monitoring techniques have clearly demonstrated the presence of venous gas emboli (VGE) during decompression. Although important to DCS research and our understanding of the physiological mechanisms of this condition, Venus gas emboli have not been considered clinically hazardous, unless in extreme numbers. Arterial gas emboli (AGE), on the other hand, are generally viewed with great concern. Arterial gas emboli can enter the cerebral arterial circulation and arrest blood flow resulting in potentially serious injury. Left ventricular gas emboli were observed with echo imaging in five volunteer subjects during exposure to simulated altitude. These serendipitous findings occurred during altitude exposure under 3 separate research protocols involving 79 subject exposures. The voluntary, fully informed consent of the subjects used in this research was obtained as required by AFR 169-3. A Hewlett-Packard SONOS 1000 Echo Imaging System was used to monitor for precordial gas emboli. The improved

resolution of the SONOS 1000 appears to account for these new findings. Four subjects had high incidence DCS and VGE during previous research flights. One subject only had one flight. The altitudes and AGE onset times for the five cases were: (1) 25,500 ft/2:23, (2) 29,000 ft/0:27, (3) 19,500 ft/3:49, (4) 29,500 ft/3:15, and (5) 29,500 ft/1:31. In all five cases, at the time of AGE onset, the VGE scores were high from all monitored locations. Four of the cases were symptomatic at the time of AGE onset (pain and skin mottling). No cerebral manifestations were observed. All subjects were immediately recompressed to ground level and successfully treated with 2 hours of post-breathing or with hyperbaric oxygen therapy. In conclusion, previously undetected AGE were demonstrated--with and without DCS symptoms--during exposure to altitude. It appears that this gas transferred from the venous side to the arterial side via either intracardiac defects or the pulmonary circulation. The clinical and operational implications of this finding are yet to be determined. Author (revised)

N94-11544*# Space Biomedical Research Inst., Houston, TX.
TRANSCRANIAL DOPPLER ULTRASOUND AND THE ETIOLOGY OF NEUROLOGIC DECOMPRESSION SICKNESS DURING ALTITUDE DECOMPRESSION
W. T. NORFLEET, M. R. POWELL, K. VASANTHA KUMAR (Krug Life Sciences, Inc., Houston, TX.), and J. WALIGORA *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 549-561 Feb. 1993
Avail: CASI HC A03/MF A03

The presence of gas bubbles in the arterial circulation can occur from iatrogenic mishaps, cardiopulmonary bypass devices, or following decompression, e.g., in deep-sea or SCUBA diving or in astronauts during extravehicular activities (EVA). We have examined the pathophysiology of neurological decompression sickness in human subjects who developed a large number of small gas bubbles in the right side of the heart as a result of hypobaric exposures. In one case, gas bubbles were detected in the middle cerebral artery (MCA) and the subject developed neurological symptoms; a 'resting' patent foramen ovalae (PFO) was found upon saline contrast echocardiography. A PFO was also detected in another individual who developed Spencer Grade 4 precordial Doppler ultrasound bubbles, but no evidence was seen of arterialization of bubbles upon insonation of either the MCA or common carotid artery. The reason for this difference in the behavior of intracardiac bubbles in these two individuals is not known. To date, we have not found evidence of right-to-left shunting of bubbles through pulmonary vasculature. The volume of gas bubbles present following decompression is examined and compared with the number arising from saline contrast injection. The estimates are comparable. Author (revised)

N94-11545*# Space Biomedical Research Inst., Houston, TX. Environmental Physiology/Biophysics Section.
A MECHANISM FOR THE REDUCTION IN RISK OF DECOMPRESSION SICKNESS IN MICROGRAVITY ENVIRONMENT Abstract Only
MICHAEL R. POWELL *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 562 Feb. 1993
Avail: CASI HC A01/MF A03

There is an apparent reduction in the incidence of decompression sickness reported by astronauts (from both the USA and the USSR) during extravehicular activity (EVA). The expected incidence, based on studies conducted under unit gravity conditions in Earth-based laboratories, is greater than that encountered during EVA. A biophysical explanation has been proposed for this difference based upon the mechanism of stress-assisted nucleation. Since the partial pressure ratio at which this gas phase forms is considerably smaller in living systems that in quiescent in vitro models, it was proposed that mechanical forces are involved. In that the lower extremities of astronautics are not gravitationally loaded in microgravity, it is possible that tissue gas micronuclei are but minimally regenerated. Most likely, gas micronuclei formed on Earth (by ambulation under 1 g conditions) would be eventually depleted. In a crossover study, 20 individuals were decompressed--from 1 ATA to 0.43 ATA for 3 hours--following either being fully ambulatory at unit gravity or following being hypokinetic and adynamic (simulated microgravity of 3-day bed rest). The subjects were monitored for gas phase formation by means of precordial Doppler monitoring. The results indicate a reduction in whole body gas phase formation in individuals who were bed rested as compared with themselves when fully ambulatory ($p = 0.02$). In hypokinetic individuals, the protection conferred was equivalent to an extra 175 minutes of oxygen prebreathe. These results are compatible with a hypothesis relating stress-assisted nucleation to the continual formation of tissue gas micronuclei and their gradual depletion with hypokinesia. Author (revised)

N94-11546*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RISK OF DECOMPRESSION SICKNESS IN THE PRESENCE OF CIRCULATING MICROBUBBLES
K. VASANTHA KUMAR (Krug Life Sciences, Inc., Houston, TX.) and MICHAEL R. POWELL *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 563-567 Feb. 1993
Avail: CASI HC A01/MF A03

In this study, we examined the association between microbubbles formed in the circulation from a free gas phase and symptoms of altitude decompression sickness (DCS). In a subgroup of 59 males of mean (S.D) age 31.2 (5.8) years who developed microbubbles during exposure to 26.59 kPa (4.3 psi) under simulated extravehicular activities (EVA), symptoms of DCS occurred in 24 (41 percent) individuals. Spencer grade 1 microbubbles occurred in 4 (7 percent), grade 2 in 9 (15 percent), grade 3 in 15 (25 percent), and grade 4 in 31 (53 percent) of subjects. Survival analysis using Cox proportional hazards regression showed that individuals with less than grade 3 CMB showed 2.46 times (95 percent confidence interval = 1.26 to 5.34) higher risk of symptoms. This information is crucial for defining the risk of DCS for inflight Doppler monitoring under space EVA. Altitude decompression sickness (DCS) occurs when there is acute reduction in ambient pressure. The symptoms of DCS are due to the formation of a free gas phase (in the form of gas microbubbles) in tissues during decompression. Musculo-skeletal pain of bends is the commonest form of DCS in altitude exposures. In the space flight environment, there is a risk of DCS when astronauts decompress from the normobaric shuttle pressure into the hypobaric space suit pressure (currently about 29.65 kPa (4.3 psi) for extra-vehicular activities (EVA). This risk is counterbalanced by a judicious combination of prior denitrogenation and staged decompression. Studies of DCS are limited by the duration of the test at reduced pressure. Since only a proportion of subjects tested develop symptoms, the information on DCS is generally incomplete or 'censored'. Many studies employ Doppler ultrasound monitoring of the precordial area for detecting circulating microbubbles (CMB). Although the association between CMB and bends pain is not causal, CMB are frequently monitored during decompression. In this paper, we examine the association between CMB and symptoms of DCS under simulated EVA profiles.
Author (revised)

N94-11547*# Space Biomedical Research Inst., Houston, TX. Environmental Physiology/Biophysics Section.
STRATEGIES AND METHODOLOGIES TO DEVELOP TECHNIQUES FOR COMPUTER-ASSISTED ANALYSIS OF GAS PHASE FORMATION DURING ALTITUDE DECOMPRESSION Abstract Only
MICHAEL R. POWELL and W. A. HALL (Krug Life Sciences, Inc., Houston, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 568 Feb. 1993
Avail: CASI HC A01/MF A03

It would be of operational significance if one possessed a device that would indicate the presence of gas phase formation in the body during hypobaric decompression. Automated analysis

of Doppler gas bubble signals has been attempted for 2 decades but with generally unfavorable results, except with surgically implanted transducers. Recently, efforts have intensified with the introduction of low-cost computer programs. Current NASA work is directed towards the development of a computer-assisted method specifically targeted to EVA, and we are most interested in Spencer Grade 4. We note that Spencer Doppler Grades 1 to 3 have increased in the FFT sonogram and spectrogram in the amplitude domain, and the frequency domain is sometimes increased over that created by the normal blood flow envelope. The amplitude perturbations are of very short duration, in both systole and diastole and at random temporal positions. Grade 4 is characteristic in the amplitude domain but with modest increases in the FFT sonogram and spectral frequency power from 2K to 4K over all of the cardiac cycle. Heart valve motion appears to characteristic display signals: (1) the demodulated Doppler signal amplitude is considerably above the Doppler-shifted blow flow signal (even Grade 4); and (2) demodulated Doppler frequency shifts are considerably greater (often several kHz) than the upper edge of the blood flow envelope. Knowledge of these facts will aid in the construction of a real-time, computer-assisted discriminator to eliminate cardiac motion artifacts. There could also exist perturbations in the following: (1) modifications of the pattern of blood flow in accordance with Poiseuille's Law, (2) flow changes with a change in the Reynolds number, (3) an increase in the pulsatility index, and/or (4) diminished diastolic flow or 'runoff.' Doppler ultrasound devices have been constructed with a three-transducer array and a pulsed frequency generator. Author (revised)

N94-11550*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

PROMETHAZINE AND ITS USE AS A TREATMENT FOR SPACE MOTION SICKNESS Abstract Only

JAMES P. BAGIAN and BRADLEY G. BECK *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 574 Feb. 1993

Avail: CASI HC A01/MF A03

Until Mar. 1989, no effective treatment--either prophylactic or symptomatic--for space motion sickness (SMS) had been discovered. Since Mar. 1989, intramuscular (IM) promethazine (PMZ) has been used in the treatment of SMS with extremely favorably results reported by the crew. A retrospective study was undertaken to quantify the efficacy of IM PMZ since its institution and the incidence of its major anticipated side-effect drowsiness and sedation. The results from a standardized crew medical debriefing conducted immediately after landing and follow-up interviews with the crews were used in establishing the efficacy and incidence of side effects from treatment. Only crews from the first 44 Shuttle flights on their first mission were considered. For a total of 132 crewmembers, 96 exhibited symptoms of SMS; and, of these, 20 were treated with IM PMZ. Ninety percent of those receiving IM PMZ 25-50mg received nearly immediate (less than 2 hours) relief of symptoms and 75 percent required no further treatment through the first 2 days of spaceflight. Those not receiving this treatment did not have any near-term resolution of their symptoms, and 50 percent were still ill through the second day of flight. This represents a significant difference at the $p = 0.46$ level. In stark contrast to the 60 percent to 73 percent incidence of sedation or drowsiness reported in individuals treated with PMZ in terrestrial environment at the doses used here, less than 5 percent reported these symptoms during spaceflight. IM PMZ is an effective therapy for SMS and is associated with minimal incidence of sedation or drowsiness. This combination of efficacy that is absent of significant side effects represents a substantial improvement in the operational situation of crewmembers afflicted with SMS. Studies to understand the mechanisms underlying these observations will be undertaken in the future. Author (revised)

N94-11551*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

UPDATE ON THE INCIDENCE AND TREATMENT OF SPACE MOTION SICKNESS Abstract Only

BRADLEY G. BECK *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 575 Feb. 1993

Avail: CASI HC A01/MF A03

Flight surgeons routinely monitor crew symptoms and treatment of space motion sickness (SMS), not only during flight, but also to obtain information postflight from each crewmember. Recent statistics indicate that the incidence of SMS has not changed since STS-26 in Sep. 1988. The percentages of mild, moderate, and severe cases has only changed slightly. However, the treatment of SMS has significantly changed since STS-26. Scopolamine/dexedrine is no longer used as a prophylaxis for SMS symptoms because of evidence of delay in symptoms. Intramuscular promethazine has been used in more than 30 individuals with a reported decrease in symptoms greater than 90 percent. A delay in symptoms has not been reported, and the duration of certain SMS symptoms has decreased due to use of intramuscular promethazine. Case studies will be discussed and several therapeutic options and doses will be demonstrated. Further treatment possibilities will be examined. Author (revised)

N94-11552*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

BASELINE CHARACTERISTICS OF DIFFERENT STRATA OF ASTRONAUT CORPS Abstract Only

PEGGY B. HAMM (Krug Life Sciences, Inc., Houston, TX.) and L. J. PEPPER *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 577 Feb. 1993

Avail: CASI HC A01/MF A03

The Longitudinal Study of Astronaut Health (LSAH) is an epidemiological study designed to study the effects of the occupational exposures incurred by astronauts in health outcomes and changes in physiological variables. Between 1959 and 1991, 195 individuals were selected for the program. The medical standards for selection have remained essentially unchanged since the Mercury Program, but the range and stringency of these criteria have been modified. Demographic and physiological variables identified during the selection year are examined for various strata of the Astronaut Corps. Specifically, age, sex, race, education, usual occupation, military affiliation, medical history, family medical history, visual and hearing measurements, physical exam variables, and specific laboratory values are investigated. Differences are examined in astronauts for the following criteria: (1) were selected prior to 1970 ($n = 73$) versus those selected after 1970 ($n = 122$); (2) have flown multiple missions versus those who have flown less than two missions; (3) have walked in space versus all others; (4) have more than 500 hours of mission time versus all others; and (5) have gone to the Moon versus all others. Length of time served in the Astronaut Corps is examined for each of these strata. Author (revised)

N94-11557*# Universities Space Research Association, Houston, TX.

PHYSIOLOGIC MECHANISMS OF CIRCULATORY AND BODY FLUID LOSSES IN WEIGHTLESSNESS IDENTIFIED BY MATHEMATICAL MODELING

K. E. SIMANONOK, R. S. SRINIVASAN (Krug Life Sciences, Inc., Houston, TX.), and J. B. CHARLES (Space Biomedical Research Inst., Houston, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 598-604 Feb. 1993

Avail: CASI HC A02/MF A03

Central volume expansion due to fluid shifts in weightlessness is believed to activate adaptive reflexes which ultimately result in a reduction of the total circulating blood volume. However, the flight data suggests that a central volume overdistention does not persist, in which case some other factor or factors must be responsible for body fluid losses. We used a computer simulation to test the hypothesis that factors other than central volume overdistention are involved in the loss of blood volume and other body fluid volumes observed in weightlessness and in weightless simulations. Additionally, the simulation was used to identify these factors. The results predict that atrial volumes and pressures return

to their prebedrest baseline values within the first day of exposure to head down tilt (HDT) as the blood volume is reduced by an elevated urine formation. They indicate that the mechanisms for large and prolonged body fluid losses in weightlessness is red cell hemoconcentration that elevates blood viscosity and peripheral resistance, thereby lowering capillary pressure. This causes a prolonged alteration of the balance of Starling forces, depressing the extracellular fluid volume until the hematocrit is returned to normal through a reduction of the red cell mass, which also allows some restoration of the plasma volume. We conclude that the red cell mass becomes the physiologic driver for a large 'undershoot' of the body fluid volumes after the normalization of atrial volumes and pressures. Author

N94-11558*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
POTENTIAL HEALTH EFFECTS OF SPACE RADIATION
CHUI-HSU YANG and LAURIE M. CRAISE (California Univ., Berkeley. Lawrence Berkeley Lab.) *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 605-610 Feb. 1993
(Contract NASA ORDER T-9297-R)
Avail: CASI HC A02/MF A03

Crewmembers on missions to the Moon or Mars will be exposed to radiation belts, galactic cosmic rays, and possibly solar particle events. The potential health hazards due to these space radiations must be considered carefully to ensure the success of space exploration. Because there is no human radioepidemiological data for acute and late effects of high-LET (Linear-Energy-Transfer) radiation, the biological risks of energetic charged particles have to be estimated from experimental results on animals and cultured cells. Experimental data obtained to date indicate that charged particle radiation can be much more effective than photons in causing chromosome aberrations, cell killing, mutation, and tumor induction. The relative biological effectiveness (RBE) varies with biological endpoints and depends on the LET of heavy ions. Most lesions induced by low-LET radiation can be repaired in mammalian cells. Energetic heavy ions, however, can produce large complex DNA damages, which may lead to large deletions and are irreparable. For high-LET radiation, therefore, there are less or no dose rate effects. Physical shielding may not be effective in minimizing the biological effects on energetic heavy ions, since fragments of the primary particles can be effective in causing biological effects. At present the uncertainty of biological effects of heavy particles is still very large. With further understanding of the biological effects of space radiation, the career doses can be kept at acceptable levels so that the space radiation environment need not be a barrier to the exploitation of the promise of space. Author (revised)

N94-11560*# Kelsey Seybold Clinic, P.A., Houston, TX.
LONGITUDINAL STUDY OF ASTRONAUT HEALTH: MORTALITY IN THE YEARS 1959-1991 Abstract Only
LEIF E. PETERSON *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 613 Feb. 1993
Avail: CASI HC A01/MF A03

We conducted a historical cohort study of mortality among 195 astronauts who were exposed to space and medical sources of radiation between 1959 and 1991. Cumulative occupational and medical radiation exposures were obtained from the astronaut radiation exposure history data base. Causes of death were obtained from obligatory death certificates and autopsy reports that were on file in the medical records. A total of 18 deaths occurred during the 32-year follow-up period for which the all-cause standardized mortality ratio (SMR) was 142 (95 percent confidence interval 84 225). There was one cancer death in the buccal cavity and pharynegeal ICD-9 rubric whose occurrence was significantly beyond expectation. Mortality for coronary disease was 59 percent lower than expected (2 deaths; SMR = 41; 95 percent confidence limit 5 147). The crude death rate for 10 occupationally related accidents was 400 deaths per 100,000 person-years, which is an order of magnitude greater than accidental death rates in mining industries. The SMR of 1027 for fatal accidents was significantly beyond expectation (14 deaths; 95 percent confidence limit 561 1723) and was similar to SMRs for accidents among aerial pesticide applications. The 10-year cumulative risk of occupational fatalities based on the exponential, Weibull, Gompertz, and linear-exponential distributions was 10 percent. Mortality from motor vehicle accidents was slightly higher than expected but was not significant (1 death; SMR = 145; 95 percent confidence limit 2 808). Radiation exposures from medical procedures accounted for a majority of cumulative dose when compared with space radiation exposures. The results of the study do not confirm the impression that astronauts are at increased risk of cancer, but this does not obviate the need for further study. Overall, it was found that astronauts are at a health disadvantage as a result of catastrophic accidents. Author (revised)

N94-11649 Tripler Army Medical Center, Honolulu, HI. Dept. of Clinical Investigation.
THE DEPARTMENT OF CLINICAL INVESTIGATION, REPORTS CONTROL SYMBOL MED-300(R-1) Annual Progress Report, Fiscal Year 1992
1 Oct. 1992 53 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A264969) Avail: CASI HC A04

The Tripler Department of Clinical Investigation had an exciting year in FY-92. Despite serious challenges to research in the form of personnel freezes, funding cuts, and increasing demands on health care professionals to provide clinical services, there was no significant fall in research productivity. More impressively, Dr. Cathy Yamauchi-Uyehara was awarded an American Heart Association grant after submitting the highest ranked proposal for the AHA district. This was made more significant in view of the AHA policy to not award grants to military investigators. The Joint Tripler AMC/Kapiolani Medical Center for Women and Children's Neonatal Fellowship Program, which conducts all non-human studies in Tripler's DCI, has continued to maintain its position at the forefront of neonatal pulmonary medicine. The contributions of Dr. John Claybaugh, Tripler's senior scientist, to both research and administration of DCI are undiminished. MAJ Thomas Mundie has provided inspiration to all phases of research at Tripler, and especially to the Joint Neonatal Fellowship Program. DTIC

N94-11681# Johns Hopkins Univ., Baltimore, MD. School of Medicine.
VISUAL PSYCHOPHYSICS OF EGOMOTION Interim Report, 1 Feb. 1992 - 31 Jan. 1993
KATHLEEN TURANO 2 Mar. 1993 7 p
(Contract AF-AFOSR-0154-91)
(AD-A265253; AFOSR-93-0259TR) Avail: CASI HC A02/MF A01

One study investigated, under two viewing conditions, an observer's ability to determine whether she/he was moving forward along a straight or curved path using simulations of optic flow patterns. In one condition, the retinal image was stabilized against the effects of eye movements, in the other condition, eye movements were unrestricted. Stabilizing the retinal image decreased performance at slow speeds. A second study further explored the role of eye movements in the perception of motion. Speed-difference thresholds were measured under conditions of stabilized and free-viewing conditions. Despite the fact that eye movements can alter the direction and speed of the retinal-image motion relative to the stimulus motion, observers were able to judge speed differences in the free-viewing condition as well as in the stabilized-viewing condition, with the exception of the slowest speed. At the slowest speed, observers were able to detect smaller speed differences in the free-viewing condition. A third study determined the optimal stimulus for motion detection by searching the spatiotemporal stimulus whose direction was identified with least contrast energy. The best stimulus was determined to be at 3 cycles/deg, 1.67 deg/s with bandwidths of 7.06 Hz and 1-0.5 octaves. DTIC

N94-11689* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 374)
Apr. 1993 77 p
(NASA-SP-7011(374); NAS 1.21:7011(374)) Avail: CASI HC A05

This bibliography lists 227 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Apr. 1993. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance.
Derived from text

N94-11787*# National Aeronautics and Space Administration, Washington, DC.
INTERNATIONAL TELEMEDICINE/DISASTER MEDICINE CONFERENCE: PAPERS AND PRESENTATIONS
1991 271 p Conference held in Bethesda, MD.; sponsored by Uniformed Services Univ. of the Health Sciences and AIAA
(NASA-NP-207; NAS 1.83:207) Avail: CASI HC A12/MF A03

The first International Telemedicine/Disaster Medicine Conference was held in Dec. 1991. The overall purpose was to convene an international, multidisciplinary gathering of experts to discuss the emerging field of telemedicine and assess its future directions; principally the application of space technology to disaster response and management, but also to clinical medicine, remote health care, public health, and other needs. This collection is intended to acquaint the reader with recent landmark efforts in telemedicine as applied to disaster management and remote health care, the technical requirements of telemedicine systems, the application of telemedicine and telehealth in the U.S. space program, and the social and humanitarian dimensions of this area of medicine.

N94-11788*# Utah Univ., Salt Lake City. School of Medicine.
MEDICAL INFORMATICS AND TELEMEDICINE: A VISION
TERRY P. CLEMMER *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 5 p 1991
Avail: CASI HC A01/MF A03

The goal of medical informatics is to improve care. This requires the commitment and harmonious collaboration between the computer scientists and clinicians and an integrated database. The vision described is how medical information systems are going to impact the way medical care is delivered in the future. CASI

N94-11789*# Memorial Univ. of Newfoundland, Saint Johns. Faculty of Medicine.
THE CANADIAN EXPERIENCE: USING TELEMEDICINE FOR THE SUPPORT OF MEDICAL CARE AT REMOTE SITES
MAXWELL HOUSE *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 8 p 1991
Avail: CASI HC A02/MF A03

While the majority of Canadians live in a narrow strip about 200 miles wide just north of the 45th parallel, a significant proportion of the population lives in non-urban, remote and sometimes isolated areas. Given this widely dispersed population, the provision of health services has always been a challenge. A list of non-urban health needs include the following: consulting services; clinical laboratory resources; investigative techniques (e.g., EEG, radiology, ultrasound, nuclear medicine); continuing education for physicians, nurses and other health professionals; teaching and training programs for administrative and support staff (dietary, housekeeping, maintenance); community health education and improved general education for health workers and families. For nearly three decades physicians and other health care professionals in the United States and Canada have been exploring the application of telecommunications to health care in rural and remote areas. The terms telemedicine and telehealth are used interchangeably to describe this activity. The prefix 'tele' refers to distance and now includes all types of communication over distance that support health care and health educational programs. Actually, telemedicine is as old as the telephone, which is still the most widely used communications technology in health care.
Author (revised)

N94-11790*# National Aeronautics and Space Administration, Washington, DC.
TELEMEDICINE AND INTERNATIONAL DISASTER RESPONSE: MEDICAL CONSULTATION TO ARMENIA AND RUSSIA VIA A TELEMEDICINE SPACEBRIDGE
BRUCE A. HOUTCHENS (Utah Univ., Salt Lake City.), TERRY P. CLEMMER (Utah Univ., Salt Lake City.), HARRY C. HOLLOWAY (Uniformed Services Univ. of the Health Sciences, Bethesda, MD.), ALEXANDER A. KISELEV (Nauchno-Proizvodstvennoe Obedinenie Soyuz Medinform, Moscow, Russia.), JAMES S. LOGAN (Space Medical Services, Tulsa, OK.), RONALD C. MERRELL (Texas Univ. Health Science Center, Houston.), ARNAULD E. NICOGOSSIAN, HAIK A. NIKOGOSSIAN (Republic Diagnostic Center, Yerevan, Armenia.), RUSSELL B. RAYMAN (Aerospace Medical Association, Alexandria, VA.), ASHOT E. SARKISIAN (Republic Diagnostic Center, Yerevan, Armenia.) et al. *In its* International Telemedicine/Disaster Medicine Conference: Papers and Presentations 22 p 1991 Submitted for publication
Avail: CASI HC A03/MF A03

The Telemedicine Spacebridge, a satellite mediated audio-video-fax link between four U.S. and two Armenian and Russian medical centers, permitted remote American consultants to assist Armenian and Russian physicians in the management of medical problems following the December 1988 earthquake in Armenia and the June 1989 gas explosion near Ufa. During 12 weeks of operations, 247 Armenian and Russian and 175 American medical professionals participated in 34 half-day clinical conferences. 209 patients were discussed, requiring expertise in 20 specialty areas. Telemedicine consultations resulted in altered diagnoses for 54, new diagnostic studies for 70, altered diagnostic processes for 47, and modified treatment plans for 47 of 185 Armenian patients presented. Simultaneous participation of several U.S. medical centers was judged beneficial; quality of data transmission was judged excellent. These results suggest that interactive consultation by remote specialists can provide valuable assistance to onsite physicians and favorably influence clinical decisions in the aftermath of major disasters. Author (revised)

N94-11791*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.
USE OF TELESCIENCE FOR BIOMEDICAL RESEARCH DURING SPACE FLIGHT
CAROLYN L. HUNTOON, HOWARD J. SCHNEIDER, and GAYLE M. KARAMANOS (General Electric Co., Houston, TX.) *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 5 p 1991
Avail: CASI HC A01/MF A03

When the U.S. first embarked on a manned space flight program, NASA's use of medical telescience was focused on crew health monitoring. In recent years, medical telescience use has been expanded to include support of basic research in space medicine. It enables ground support personnel to assist on-board crews in the performance of experiments and improves the quality and quantity of data return. NASA is continuing to develop its telescience capabilities. Future plans include telemedicine that will enable physicians on Earth to support crewmembers during flight and telescience that will enable investigators at their home institutions to support and conduct in-flight medical research. NASA's use of telescience for crew safety and biomedical research from Project Mercury to the present is described and NASA's plans for the future are presented. Author (revised)

N94-11792*# Universite Catholique de Louvain (Belgium). School of Epidemiology and Public Health.
GLOBAL CONSIDERATIONS FOR IMPLEMENTATION OF TELEMEDICINE
M. F. LECHAT *In* NASA, Washington, International

Telemedicine/Disaster Medicine Conference: Papers and Presentations 6 p 1991
Avail: CASI HC A02/MF A03

In Dec. 1989, the United Nations proclaimed the Decade 1990-1999 as the International Decade for Natural Disasters Reduction (IDNDR). The Decade identified a number of research programs. IDNDR, provides a unique opportunity to explore the potential offered by the emerging technologies, and to promote, develop, and support those technologies deemed adequate to make the next century a safer one, especially in the poorest countries of the world. But all this improvement cannot be accomplished in a vacuum. We must begin now to eliminate pitfalls and illusions. A new attitude must emerge. In the scope of reducing human damages resulting from disasters, we must reconsider the cross-cultural understanding, and reach a real awareness which combines humility with a sense of relativeness. Promoting the right context is essential to the mandate of the Decade.

Derived from text

N94-11793*# Uniformed Services Univ. of the Health Sciences, Bethesda, MD. Dept. of Preventative Medicine and Biometrics.
TROPICAL MEDICINE: TELECOMMUNICATIONS AND TECHNOLOGY TRANSFER
LLEWELLYN J. LEGTERS *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 10 p 1991
Avail: CASI HC A02/MF A03

The potential for global outbreaks of tropical infectious diseases, and our ability to identify and respond to such outbreaks is a major concern. Rapid, efficient telecommunications is viewed as part of the solution to this set of problems - the means to link a network of epidemiological field stations via satellite with U.S. academic institutions and government agencies, for purposes of research, training in tropical medicine, and observation of and response to epidemic emergencies. At a workshop, telecommunications and technology transfer were addressed and applications of telecommunications technology in long-distance consultation, teaching and disaster relief were demonstrated. Applications in teaching and consultation in tropical infectious diseases is discussed. Derived from text

N94-11794*# International Telecommunications Satellite Organization, Washington, DC. Service Assistance.
APPLICATIONS OF THE INTELSAT SYSTEM TO REMOTE HEALTH CARE
ANDREA MALETER *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 9 p 1991
Avail: CASI HC A02/MF A03

INTELSAT, the International Telecommunications Satellite Organization, is a not-for-profit commercial cooperate of 124 member nations, created on 20 August 1964. It owns and operates a global system of communications satellites that provides international telecommunications services to 180 countries, territories, and dependencies, and domestic telecommunications services to 40 nations. INTELSAT has actively encouraged the use of satellites for both telemedicine and disaster relief. Topics discussed include: INTELSAT domestic/regional services; use of transportable antennas; INTELNET; using the existing telecommunications infrastructure for remote health care applications: Project Access; INTELSAT's role in disaster telecommunications efforts; and how INTELSAT's existing infrastructure can be used for disaster telecommunications.

Derived from text

N94-11795*# Texas Univ., Houston. Dept. of Surgery.
CLINICAL ASPECTS OF TELEMEDICINE
RONALD C. MERRELL *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 3 p 1991
Avail: CASI HC A01/MF A03

Communication among physicians is an essential in order to combine our experiences for the elucidation and application of new knowledge and for the accurate and uniform application of established medical practice. This communication requires an adequate understanding of the culture of the patient and the social context of disease and indeed the culture of the physician. Malnutrition in Bangladesh means caloric insufficiency, and a program to lower cholesterol would be impertinent, while a program to enhance the nutrition of patients in Texas by an international effort to import more grain would be ludicrous. In the same vein a public health effort to combat a colonic cirrhosis in Mecca would be as silly as a program to increase fiber in the diet of the Bantu. Clinical communication must acknowledge the culture of the issue at hand and the differences in the experiential base of the physicians. Not only do geography and culture affect the potential differences in the experiential bases, but the world utilizes very different traditions of education and science in training physicians. We are influenced by the diseases we treat, and learn to look for the expected at least as much as we are attentive to the unexpected. A physician in Siberia would be much more likely to recognize frostbite than one from Buenos Aires, and the Argentine doctor would much more likely consider Chaga's Disease to explain abdominal pain than a colleague in Zurich. Beyond these obvious issues in communication among physicians we must deal with the many languages and idioms used in the world. An overview of using Telemedicine SpaceBridge after the earthquake in the Republic of Armenia in 1988 is presented. Author (revised)

N94-11796*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NEW TECHNOLOGY APPLIED TO TELEMEDICINE
EDWARD F. MILLER *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 19 p 1991
Avail: CASI HC A03/MF A03

Satellite communications technology was used for establishing international telemedicine communications links in a number of instances, (e.g., Telemedicine SpaceBridge between Armenia and the United States in 1989, and the proposed linkages shown, for demonstration during this conference and during 1992 and 1993). In the current example, geostationary satellites are used to provide intercontinental communications links between the two countries and also for distribution within each country. Author

N94-11797*# Chicago Medical School, IL.
LINKING MEDICAL RECORDS TO AN EXPERT SYSTEM
FRANK NAEYMI-RAD, DAVID TRACE, and FABIO DESOUZAALMEIDA (Kaiser Medical Center, Santa Clara, CA.) *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 15 p 1991
Avail: CASI HC A03/MF A03

This presentation will be done using the IMR-Entry (Intelligent Medical Record Entry) system. IMR-Entry is a software program developed as a front-end to our diagnostic consultant software MEDAS (Medical Emergency Decision Assistance System). MEDAS (the Medical Emergency Diagnostic Assistance System) is a diagnostic consultant system using a multimembership Bayesian design for its inference engine and relational database technology for its knowledge base maintenance. Research on MEDAS began at the University of Southern California and the Institute of Critical Care in the mid 1970's with support from NASA and NSF. The MEDAS project moved to Chicago in 1982; its current progress is due to collaboration between Illinois Institute of Technology, The Chicago Medical School, Lake Forest College and NASA at KSC. Since the purpose of an expert system is to derive a hypothesis, its communication vocabulary is limited to features used by its knowledge base. The development of a comprehensive problem based medical record entry system which could handshake with an expert system while creating an electronic medical record at the same time was studied. IMR-E is a computer based patient record that serves as a front end to the expert system MEDAS. IMR-E is a graphically oriented comprehensive medical record. The programs major components are demonstrated.

Author (revised)

N94-11798*# Telemedicine Systems Corp., Miami, FL.
COMMERCIAL APPLICATIONS OF TELEMEDICINE
THOMAS A. NATIELLO *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 4 p 1991
Avail: CASI HC A01/MF A03

Telemedicine Systems Corporation was established in 1976 and is a private commercial supplier of telemedicine systems. These systems are various combinations of communications and diagnostic technology, designed to allow the delivery of health care services to remote facilities. The technology and the health care services are paid for by the remote facilities, such as prisons. Author

N94-11799*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SPACE TECHNOLOGY IN REMOTE HEALTH CARE
SAM L. POOL *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 7 p 1991
Avail: CASI HC A02/MF A03

Crews and passengers on future long-duration Earth orbital and interplanetary missions must be provided quality health services - to combat illnesses and accidental injuries, and for routine preventive care. People on Earth-orbital missions can be returned relatively easily to Earth, but those on interplanetary missions cannot. Accordingly, crews on long-duration missions will likely include at least one specially trained person, perhaps a physician's assistant, hospital corpsman, nurse, or physician who will be responsible for providing onboard health services. Specifically, we must determine the most effective way to administer health care to a remotely located population. NASA with the cooperation of the Department of Health, Education, and Welfare is pursuing a program for providing health services to remote locations on Earth as a necessary step to developing and verifying this capability on a spacecraft. The STARPAHC program is described.
Author (revised)

N94-11800*# NYNEX Science and Technology, Inc., White Plains, NY.
THE USE OF COMMUNICATION TECHNOLOGY IN MEDICINE
HOWARD P. REIS *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 11 p 1991
Avail: CASI HC A03/MF A03

NYNEX Science and Technology is engineering a multi-layered approach to multimedia communications by combining high-resolution images, video, voice, and text into a new fiber-optic service. The service, Media Broadband Service (MBS), is a network-based visual communications capability. It permits real time sharing of images in support of collaborative work among geographically dispersed locations. The health care industry was identified as a primary target market due to their need for high resolution images, the need to transport these images over great distances, and the need to achieve the transport in a short amount of time. The NYNEX Corporation, the current state of the MBS project, including the market needs driving the development of MBS, the overall design of the service, its current implementation and development status, and the progress of MBS projects underway for various customers participating in the initial service offering are described. Author (revised)

N94-11801*# Office of Emergency Preparedness, Rockville, MD.
THE NATIONAL DISASTER MEDICAL SYSTEM
THOMAS P. REUTERSHAN *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 8 p 1991
Avail: CASI HC A02/MF A03

The Emergency Mobilization Preparedness Board developed plans for improved national preparedness in case of major catastrophic domestic disaster or the possibility of an overseas conventional conflict. Within the health and medical arena, the working group on health developed the concept and system design for the National Disaster Medical System (NDMS). A description of NDMS is presented including the purpose, key components, medical response, patient evacuation, definitive medical care, NDMS activation and operations, and summary and benefits.
CASI

N94-11802*# Uniformed Services Univ. of the Health Sciences, Bethesda, MD. Dept. of Preventative Medicine and Biometrics.
SATELLITE, ENVIRONMENTAL, AND MEDICAL INFORMATION APPLIED TO EPIDEMIOLOGICAL MONITORING
DONALD R. ROBERTS and LLEWELLYN J. LEGTERS *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 7 p 1991
Avail: CASI HC A02/MF A03

Improved communications and space-science technologies, such as remote sensing, offer hope of new, more holistic approaches to combating many arthropod-borne disease problems. The promise offered by these technologies has surfaced at a time when global and national efforts at disease control are in decline. Indeed, these programs seem to be losing ground against the arthropod-borne diseases just as rapidly as we seem to be moving forward in technological development. Given these circumstances, we can only hope that remote sensing and geographic information system (GIS) technologies can be pressed into service to help target the temporal and spatial application of control measures and to help in developing new control strategies. Author (revised)

N94-11803*# Interactive Telemedical Systems, Coral Gables, FL.
A TELEMEDICINE HEALTH CARE DELIVERY SYSTEM
JAY H. SANDERS *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 4 p 1991
Avail: CASI HC A01/MF A03

The Interactive Telemedicine Systems (ITS) system was specifically developed to address the ever widening gap between our medical care expertise and our medical care delivery system. The frustrating reality is that as our knowledge of how to diagnose and treat medical conditions has continued to advance, the system to deliver that care has remained in an embryonic stage. This has resulted in millions of people being denied their most basic health care needs. Telemedicine utilizes an interactive video system integrated with biomedical telemetry that allows a physician at a base station specialty medical complex or teaching hospital to examine and treat a patient at multiple satellite locations, such as rural hospitals, ambulatory health centers, correctional institutions, facilities caring for the elderly, community hospital emergency departments, or international health facilities. Based on the interactive nature of the system design, the consulting physician at the base station can do a complete history and physical examination, as if the patient at the satellite site was sitting in the physician's office. This system is described. Author (revised)

N94-11804*# Center for Public Service Communications, Arlington, VA.
COMMUNICATIONS INFRASTRUCTURE REQUIREMENTS FOR TELEMEDICINE/TELEHEALTH IN THE CONTEXT OF PLANNING FOR AND RESPONDING TO NATURAL DISASTERS: CONSIDERING THE NEED FOR SHARED REGIONAL NETWORKS
JOHN CARVER SCOTT *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 6 p 1991
Avail: CASI HC A02/MF A03

During the course of recent years the frequency and magnitude of major disasters - of natural, technological, or ecological origin - have made the world community dramatically aware of the immense losses of human life and economic resources that are caused regularly by such calamities. Particularly hard hit are developing countries, for whom the magnitude of disasters frequently outstrips the ability of the society to cope with them. In many cases this

situation can be prevented, and the recent trend in disaster management has been to emphasize the importance of preparedness and mitigation as a means of prevention. In cases of disaster, a system is needed to respond to relief requirements, particularly the delivery of medical care. There is no generic telecommunications infrastructure appropriate for the variety of applications in medical care and disaster management. The need to integrate telemedicine/telehealth into shared regional disaster management telecommunications networks is discussed. Focus is on the development of infrastructure designed to serve the needs of disaster prone regions of the developing world.

Derived from text

N94-11805*# Uniformed Services Univ. of the Health Sciences, Tuscon, AZ. School of Medicine.

INTERNATIONAL DISASTER RESEARCH

MARTIN ELLIOT SILVERSTEIN *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 4 p 1991

Avail: CASI HC A01/MF A03

No existing telecommunications system can be expected to provide strategy and tactics appropriate to the complex, many faceted problem of disaster. Despite the exciting capabilities of space, communications, remote sensing, and the miracles of modern medicine, complete turnkey transfers to the disaster problem do not make the fit, and cannot be expected to do so. In 1980, a Presidential team assigned the mission of exploring disaster response within the U.S. Federal Government encountered an unanticipated obstacle: disaster was essentially undefined. In the absence of a scientifically based paradigm of disaster, there can be no measure of cost effectiveness, optimum design of manpower structure, or precise application of any technology. These problems spawned a 10-year, multidisciplinary study designed to define the origins, anatomy, and necessary management techniques for catastrophes. The design of the study necessarily reflects interests and expertise in disaster medicine, emergency medicine, telecommunications, computer communications, and forensic sciences. This study is described.

Derived from text

N94-11806*# National Aeronautics and Space Administration, Washington, DC.

MEDICAL CARE DELIVERY IN THE US SPACE PROGRAM

DONALD F. STEWART *In its* International Telemedicine/Disaster Medicine Conference: Papers and Presentations 3 p 1991

Avail: CASI HC A01/MF A03

The stated goal of this meeting is to examine the use of telemedicine in disaster management, public health, and remote health care. NASA has a vested interest in providing health care to crews in remote environments. NASA has unique requirements for telemedicine support, in that our flight crews conduct their job in the most remote of all work environments. Compounding the degree of remoteness are other environmental concerns, including confinement, lack of atmosphere, spaceflight physiological deconditioning, and radiation exposure, to name a few. In-flight medical care is a key component in the overall support for missions, which also includes extensive medical screening during selection, preventive medical programs for astronauts, and in-flight medical monitoring and consultation. This latter element constitutes the telemedicine aspect of crew health care. The level of in-flight resources dedicated to medical care is determined by the perceived risk of a given mission, which in turn is related to mission duration, planned crew activities, and length of time required for return to definitive medical care facilities. Derived from text

N94-11807*# Academy of Sciences (USSR), Moscow. Space Research Inst.

USE OF SATELLITE TELECOMMUNICATIONS FOR TELEMEDICINE

GENNADY TAMKOVICH *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 5 p 1991

Avail: CASI HC A01/MF A03

The use of space telecommunications facilities in the interests of medicine should establish a reliable and timely connection between the specialists involved and access for each of them to information sources the need. Since a certain global-scale program should be implemented for this goal to be achieved, one of the top-priority tasks is to determine appropriate orbital facilities for telecommunications as well as appropriate areas and countries for them, outlining the territories where portable data receive/transport records can be placed and stations that are cheap and simple enough to operate can be stored. Eventually the satellite telecommunications system should encourage health workers to unite in a world community on the basis of a regular and efficient information exchange with the goal of protecting the health of man and the peace of Earth. This goal could only be achieved by gradually removing differences in the domain of medical education and information in different regions over the globe, by providing a possibility of rapid and coordinated access to the information on medical problems of interest on the global scale, as well as by coordinating the discussion and solution of all problems associated with the development and progress of the satellite communications system. Derived from text

N94-11808*# Nauchno-Proizvodstvennoe Obedinenie Precision Instruments, Moscow (Russia).

USE OF LOW ORBITAL SATELLITE COMMUNICATIONS SYSTEMS FOR HUMANITARIAN PROGRAMS

VLADIMIR N. VLASOV and VLADIMIR GORKOVOY *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 9 p 1991

Avail: CASI HC A02/MF A03

Communication and information exchange play a decisive role in progress and social development. However, in many parts of the world the communication infrastructure is inadequate and the capacity for on-line exchange of information may not exist. This is true of underdeveloped countries, remote and relatively inaccessible regions, sites of natural disasters, and of all cases where the resources needed to create complex communication systems are limited. The creation of an inexpensive space communications system to service such areas is therefore a high priority task. In addition to a relatively low-cost space segment, an inexpensive space communications systems requires a large number of ground terminals, which must be relatively inexpensive, energy efficient (using power generated by storage batteries, or solar arrays, etc.), small in size, and must not require highly expert maintenance. The ground terminals must be portable, and readily deployable. Communications satellites in geostationary orbit at altitudes of about 36,000 km are very expensive and require complex and expensive ground stations and launch vehicles. Given current technology, it is categorically impossible to develop inexpensive satellite systems with portable ground terminals using such satellites. To solve the problem of developing an inexpensive satellite communications system that can operate with relatively small ground stations, including portable terminals, we propose to use a system with satellites in low Earth orbit, at an altitude of 900-1500 km. Because low orbital satellites are much closer to the Earth than geostationary ones and require vastly less energy expenditure by the satellite and ground terminals for transmission of messages, a system using them is relatively inexpensive. Such a system could use portable ground terminals no more complex than ordinary mobile police radios. Author (revised)

N94-11809*# National Aeronautics and Space Administration, Washington, DC.

US-USSR TELEMEDICINE CONSULTATION SPACEBRIDGE TO ARMENIA AND UFA Final Report

In its International Telemedicine/Disaster Medicine Conference: Papers and Presentations 49 p 1991 Prepared in cooperation with Nauchno-Proizvodstvennoe Obedinenie Soyuz Medinform, Moscow, Russia

Avail: CASI HC A03/MF A03

The Final Report on the U.S.-U.S.S.R. Telemedicine Consultation Spacebride to Armenia and Ufa is presented. The goal of this activity was to provide expert medical consultation to

the Armenian medical personnel in the areas of plastic and reconstructive surgery, physical and psychological rehabilitation, public health, and epidemiology following the devastating earthquake in Dec. 1988. The U.S. and U.S.S.R. implementation teams developed new standards for medical information transmittal as well as protocols and schedules on how to conduct medical consultations. The consultations were provided to the Republic Diagnostic Center in Yerevan, U.S.S.R. by four U.S. medical centers: University of Utah/LDS Hospital, University of Texas, Maryland Institute for Emergency Medical Service Systems, and Uniformed Services University of the Health Sciences.

Derived from text

N94-11810*# Committee on Government Operations (U.S. House).

THE REVITALIZATION OF HEALTH AND EDUCATION IN RURAL AMERICA ACT OF 1992

GLENN ENGLISH *In* NASA, Washington, International Telemedicine/Disaster Medicine Conference: Papers and Presentations 17 p 1991

Avail: CASI HC A03/MF A03

During the preceding decade of the 1980's, rural communities witnessed an exodus of over 5 million residents to urban and suburban areas of the nation. It has become increasingly clear that rural parts of the country must adopt aggressive strategies to strengthen rural communities and enhance the quality of life for its citizens into the 21st century. Studies by the U.S. Department of Commerce, Office of Technology Assessment, and the Aspen Institute all identify advanced telecommunications systems as the linchpin for a vigorous future for rural America. The Revitalization of Health and Education in Rural America Act of 1992 incorporates these recommendations into viable strategies to improve health care and educational services for rural citizens. By linking up hospitals and schools through advanced telecommunications technology, vast geographic distances are instantly reduced. With the proper infrastructure in place, up-to-date telecommunications services will facilitate endless opportunities for improving the quality of life in remote areas. This comprehensive legislation is the critical first step in forging a partnership with urban communities to create an economically sound and technologically advanced America for generations to come. Improvement of health care and educational services in rural areas through the implementation of interactive telecommunications systems is addressed. A copy of the Act is included. Author (revised)

N94-11991*# Krug Life Sciences, Inc., Houston, TX.

PROCEEDINGS OF THE FIRST JOINT NASA CARDIOPULMONARY WORKSHOP

SUZANNE M. FORTNEY, ed. (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.) and ALAN R. HARGENS, ed. (National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.) Apr. 1991 171 p Workshop held in Houston, TX, 5-7 Dec. 1990; sponsored by NASA. Washington and NASA. Johnson Space Center

(Contract NAS9-17720)

(NASA-CP-10068; NAS 1.55:10068) Avail: CASI HC A08/MF A02

The topics covered include the following: flight echocardiography, pulmonary function, central hemodynamics, glycerol hyperhydration, spectral analysis, lower body negative pressure countermeasures, orthostatic tolerance, autonomic function, cardiac deconditioning, fluid and renal responses to head-down tilt, local fluid regulation, endocrine regulation during bed rest, autogenic feedback, and chronic cardiovascular measurements. The program ended with a general discussion of weightlessness models and countermeasures.

N94-11992*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Lompoc, CA.

CAROTID-CARDIAC BAROREFLEX: RELATION WITH ORTHOSTATIC HYPOTENSION FOLLOWING SIMULATED MICROGRAVITY AND IMPLICATIONS FOR DEVELOPMENT OF COUNTERMEASURES Abstract Only

VICTOR A. CONVERTINO *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 3-5 Apr. 1991

Avail: CASI HC A01/MF A02

In a series of studies, we have examined the effects of exposure to simulated microgravity, varying states of vascular volume, and acute exercise on the function of the carotid-cardiac baroreflex in man. In the first study, exposure to simulated microgravity (6 degree headdown bedrest) reduced the sensitivity and buffer capacity of the vagal baroreceptor-cardiac reflex mechanisms and this impaired baroreflex function was associated with orthostatic hypotension. Since the reduction in plasma volume during BR was not correlated with impaired baroreflex function, a second study was conducted which demonstrated that the carotid-cardiac baroreflex response was not affected by either acute hypovolemia or hypervolemia. These results suggest that acute fluid replacement prior to reentry may not reverse impaired baroreflex function associated with postflight hypotension. In a third study, we demonstrated that one bout of maximal exercise increased baroreflex sensitivity and buffer capacity through 24 h post-exercise. These baroreflex changes were opposite to those observed following BR. Taken together, these data suggest that the contributions of reduced blood volume and impaired carotid-cardiac baroreflex function to orthostatic hypotension following exposure to microgravity are probably separate and additive; maximal exercise in addition to fluid replacement may provide an acute effective countermeasure against postflight hypotension. Author (revised)

N94-11993*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ECHOCARDIOGRAPHY IN THE FLIGHT PROGRAM

JOHN B. CHARLES, MICHAEL W. BUNGO, and SHARON L. MULVAGH *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 7-9 Apr. 1991

Avail: CASI HC A01/MF A02

Observations on American and Soviet astronauts have documented the association of changes in cardiovascular function during orthostasis with space flight. A basic understanding of the cardiovascular changes occurring in astronauts requires the determination of cardiac output and total peripheral vascular resistance as a minimum. In 1982, we selected ultrasound echocardiography as our means of acquiring this information. Ultrasound offers a quick, non-invasive and accurate means of determining stroke volume which, when combined with the blood pressure and heart rate measurements of the stand test, allows calculation of changes in peripheral vascular resistance, the body's major response to orthostatic stress. The history of echocardiography in the Space Shuttle Program is discussed and the results are briefly presented. Derived from text

N94-11994*# California Univ., San Diego.

PULMONARY FUNCTION IN MICROGRAVITY: KC-135 EXPERIENCE Abstract Only

HAROLD J. GUY and G. K. PRISK *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 11 Apr. 1991

Avail: CASI HC A01/MF A02

We have commenced a KC-135 program that parallels and proceeds our Spacelab (SLS-1) pulmonary function experiment. Our first task was to elucidate the affect of normal gravitation on the shape of the maximum expiratory flow volume (MEFV) curve. Nine normal subjects performed multiple MEFV maneuvers at 0-G, 1-G, and approximately 1.7-G. The MEFV curves for each subject were filtered, aligned at RV, and ensemble-averaged to produce an average MEFV curve for each state, allowing differences to be studied. Most subjects showed a decrease in the FVC at 0-G, which we attribute to an increased intrathoracic blood volume. In

most of these subjects, the mean lung volume associated with a given flow was lower at 0-G, over about the upper half of the vital capacity. This is similar to the change previously reported during heat out immersion and is consistent with the known affect of engorgement of the lung with blood, on elastic recoil. There were also consistent but highly individual changes in the position and magnitude of detailed features of the curve, the individual patterns being similar to those previously reported on transition from the erect to the supine position. This supports the idea that the location and motion of choke points which determine the detailed individual configuration of MEFV curves, can be significantly influenced by gravitational forces, presumably via the effects of change in longitudinal tension on local airway pressure-diameter behavior and wave speed. We have developed a flight mass spectrometer and have commenced a study of single breath gradients in gas exchange, inert gas washouts, and rebreathing cardiac outputs and lung volumes at 0-G, 1-G, and 1.7-G. Comparison of our results with those from SLS-1 should identify the opportunities and limitations of the KC-135 as an accessible microgravity resource. Author (revised)

N94-11995*# Air Force Systems Command, Brooks AFB, TX.
CENTRAL CIRCULATORY HEMODYNAMICS AS A FUNCTION OF GRAVITATIONAL STRESS
RICK D. LATHAM, C. D. WHITE, J. W. FANTON, R. W. OWENS, J. F. BARBER, B. E. LEWKOWSKI, and O. T. GOFF *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 13-36 Apr. 1991
Avail: CASI HC A03/MF A02

This study focuses on an evaluation of the central hemodynamics in a nonhuman primate model to variations in gravitational states. The baboon, phylogenectically close to man, was chosen as the human surrogate. The study environments selected are head-down and head-up tilt in the physiology laboratory, centrifugation to test hypergravic stress, and parabolic flights to test transient acute responses to microgravity.
Derived from text

N94-11996*# New Mexico Univ., Albuquerque. Dept. of Biology.
GLYCEROL-INDUCED HYPERHYDRATION
MARVIN L. RIEDESEL, TIMOTHY P. LYONS, and M. COLLEEN MCNAMARA *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 37-49 Apr. 1991
Avail: CASI HC A03/MF A02

Maintenance of euhydration is essential for maximum work performance. Environments which induce hypohydration reduce plasma volume and cardiovascular performance progressively declines as does work capacity. Hyperhydration prior to exposure to dehydrating environments appears to be a potential countermeasure to the debilitating effects of hypohydration. The extravascular fluid space, being the largest fluid compartment in the body, is the most logical space by which significant hyperhydration can be accomplished. Volume and osmotic receptors in the vascular space result in physiological responses which counteract hyperhydration. Our hypothesis is that glycerol-induced hyperhydration (GIH) can accomplish extravascular fluid expansion because of the high solubility of glycerol in lipid and aqueous media. A hypertonic solution of glycerol is rapidly absorbed from the gastrointestinal tract, results in mild increases in plasma osmolality and is distributed to 65 percent of the body mass. A large volume of water ingested within minutes after glycerol intake results in increased total body water because of the osmotic action and distribution of glycerol. The resulting expanded extravascular fluid space can act as a reservoir to maintain plasma volume during exposure to dehydrating environments. The fluid shifts associated with exposure to microgravity result in increased urine production and is another example of an environment which induces hypohydration. Our goal is to demonstrate that GIH will facilitate maintenance of euhydration and cardiovascular performance during space flight and upon return to a 1 g environment. Derived from text

N94-11997*# Kentucky Univ., Lexington. Center for Biomedical Engineering.
SPECTRAL ANALYSIS OF RESTING CARDIOVASCULAR VARIABLES AND RESPONSES TO OSCILLATORY LBNP BEFORE AND AFTER 6 DEGREE HEAD DOWM BEDREST
CHARLES F. KNAPP, J. M. EVANS, A. PATWARDHAN, D. LEVENHAGEN, M. WANG, and JOHN B. CHARLES *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 51-60 Apr. 1991
Avail: CASI HC A02/MF A02

A major focus of our research program is to develop noninvasive procedures for determining changes in cardiovascular function associated with the null gravity environment. We define changes in cardiovascular function to be (1) the result of the regulatory system operating at values different from 'normal' but with an overall control system basically unchanged by the null gravity exposure, or (2) the result of operating with a control system that has significantly different regulatory characteristics after an exposure. To this end, we have used a model of weightlessness that consisted of exposing humans to 2 hrs. in the launch position, followed by 20 hrs. of 6 deg head down bedrest. Our principal objective was to use this model to measure cardiovascular responses to the 6 deg head down bedrest protocol and to develop the most sensitive 'systems identification' procedure for indicating change. A second objective, related to future experiments, is to use the procedure in combination with experiments designed to determine the degree to which a regulatory pathway has been altered and to determine the mechanisms responsible for the changes. Derived from text

N94-11998*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.
EFFECT OF PROLONGED LBNP AND SALINE INGESTION ON PLASMA VOLUME AND ORTHOSTATIC RESPONSES DURING BED REST
SUZANNE M. FORTNEY, LARRY DUSSACK, TRACY REHBEIN, MARGIE WOOD, and LAURA STEINMANN *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 61-70 Apr. 1991
(Contract RTOP 199-14-11-13)
Avail: CASI HC A02/MF A02

Orthostatic intolerance remains a significant problem following space flight despite frequent use of the saline fluid-loading countermeasure and volitional use of an anti-gravity suite during reentry and landing. The purpose of this project is to examine the plasma volume (PV), endocrine, and orthostatic responses of bedrested subjects following 2-hr and 4-hr treatments of lower body negative pressure (LBNP) and saline ingestion. Ten healthy men were randomly assigned into 2 groups. Group A underwent a 4-hr LBNP/saline treatment on best rest day 5 and the 2-hr treatment on day 11. Group B underwent the 2-hr treatment on day 6 and the 4-hr treatment on day 10. Blood volume was determined before and after bed rest using radiolabelling. Changes in PV between measurements were calculated from changes in hematocrit and estimated red cell volume. Urinary excretion of anti-diuretic hormone (ADH) and aldosterone (ALD) were measured each day during the study. Orthostatic responses were measured using a ramp LBNP protocol before bed rest, before each treatment, and 24 hours after each treatment. Both 2-hr and 4-hr treatments resulted in a restoration of PV to pre-bed rest levels which persisted at least 24 hours. This increase in PV was associated with significant increases in urinary excretion of ADH and ALD. Twenty-four hours after the 4-hr treatment, the heart rate and pulse pressure response to LBNP were significantly lower and stroke volumes during LBNP were increased. Twenty-four hours after the 2-hr treatment, there was no evidence of improvement in orthostatic responses. These results suggest that a countermeasure which simply restores PV during space flight may not be sufficient for restoring orthostatic responses. Author

N94-11999*# Texas Univ., Dallas. Div. of Cardiology.
FITNESS, AUTONOMIC REGULATION AND ORTHOSTATIC TOLERANCE

JAY C. BUCKEY *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 71-78 Apr. 1991
Avail: CASI HC A02/MF A02

Work on this grant has consisted of two major studies of cardiovascular regulation in athletes along with several smaller supporting studies. This summary will give a brief overview of two major studies, and then conclude with an analysis of what the findings from these studies mean practically, and how they can be applied to current problems with post-flight orthostatic intolerance. The first study addresses a cross-sectional analysis of orthostatic intolerance in highly aerobically trained individuals; the second addresses ventricular pressure/volume relationships in athletes. Author (revised)

N94-12000*# Medical Coll. of Virginia, Richmond. Depts. of Medicine and Physiology.
VALSALVA MANEUVER: INSIGHTS INTO BAROREFLEX MODULATION OF HUMAN SYMPATHETIC ACTIVITY
MICHAEL L. SMITH, DWAIN L. ECKBERG, JANICE M. FRITSCH, LARRY A. BEIGHTOL, and KENNETH A. ELLENBOGEN *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 79-87 Apr. 1991
Avail: CASI HC A02/MF A02

Valsalva's maneuver, voluntary forced expiration against a closed glottis, is a well-characterized research tool, used to assess the integrity of human autonomic cardiovascular control. Valsalva straining provokes a stereotyped succession of alternating positive and negative arterial pressure and heart rate changes mediated in part by arterial baroreceptors. Arterial pressure changes result primarily from fluctuating levels of venous return to the heart and changes of sympathetic nerve activity. Muscle sympathetic activity was measured directly in nine volunteers to explore quantitatively the relation between arterial pressure and human sympathetic outflow during pressure transients provoked by controlled graded Valsalva maneuvers. Our results underscore several properties of sympathetic regulation during Valsalva straining. First, muscle sympathetic nerve activity changes as a mirror image of changes in arterial pressure. Second, the magnitude of sympathetic augmentation during Valsalva straining predicts phase 4 arterial pressure elevations. Third, post-Valsalva sympathetic inhibition persists beyond the return of arterial and right atrial pressures to baseline levels which reflects an alteration of the normal relation between arterial pressure and muscle sympathetic activity. Therefore, Valsalva straining may have some utility for investigating changes of reflex control of sympathetic activity after space flight; however, measurement of beat-to-beat arterial pressure is essential for this use. The utility of this technique in microgravity can not be determined from these data. Further investigations are necessary to determine whether these relations are affected by the expansion of intrathoracic blood volume associated with microgravity. Author (revised)

N94-12001*# Arizona Univ., Tucson. Dept. of Exercise and Sport Sciences.
MECHANISTIC STUDIES ON REDUCED EXERCISE PERFORMANCE AND CARDIAC DECONDITIONING WITH SIMULATED ZERO GRAVITY
CHARLES M. TIPTON *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 89-95 Apr. 1991
(Contract NAG2-392)
Avail: CASI HC A02/MF A02

The primary purpose of this research is to study the physiological mechanisms associated with the exercise performance of rats subjected to conditions of simulated weightlessness. A secondary purpose is to study related physiological changes associated with other systems. To facilitate these goals, a rodent suspension model was developed (Overton-Tipton) and a VO2 max testing procedure was perfected. Three methodological developments occurred during this past year deserving of mention. The first was the refinement of the tail suspension model so that (1) the heat dissipation functions of the caudal artery can be better utilized, and (2) the blood flow distribution to the tail would have less external constriction. The second was the development on a one-leg weight bearing model for use in simulated weightlessness studies concerned with change in muscle mass, muscle enzyme activity, and hind limb blood flow. The chemical body composition of 30 rats was determined and used to develop a prediction equation for percent fat using underwater weighing procedures to measure carcass specific gravity and to calculate body density, body fat, and fat free mass. Author (revised)

N94-12002*# California Univ., San Diego, La Jolla. Dept. of Medicine.
FLUID COMPARTMENT AND RENAL FUNCTION ALTERATIONS IN THE RAT DURING 7 AND 14 DAY HEAD DOWN TILT
BRYAN J. TUCKER *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 97-108 Apr. 1991 Sponsored by NASA, Ames Research Center
(Contract NAG2-659)
Avail: CASI HC A03/MF A02

Exposure to conditions of microgravity for any extended duration can modify the distribution of fluid within the vascular and interstitial spaces, and eventually intracellular volume. Whether the redistribution of fluid and resetting of volume homeostasis mechanisms is appropriate for the long term environmental requirements of the body in microgravity remains to be fully defined. The event that initiates the change in fluid volume homeostasis is the cephalad movement of fluid which potentially triggers volume sensors and stretch receptors (atrial stretch with the resulting release of atrial natriuretic peptide) and suppresses adrenergic activity via the carotid and aortic arch baroreceptors. All these events act in concert to reset blood and interstitial volume to new levels, which in turn modify the renin-angiotensin system. All these factors have an influence on the kidney, the end organ for fluid volume control. How the fluid compartment volume changes interrelate with alterations in renal functions under conditions of simulated microgravity is the focus of the present investigation which utilizes 25-30 deg head-down tilt in the rat. Author

N94-12003*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
LOCAL FLUID SHIFTS AND EDEMA IN HUMANS DURING SIMULATED MICROGRAVITY
ALAN R. HARGENS *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 109-119 Apr. 1991
(Contract RTOP 199-14-12-04)
Avail: CASI HC A03/MF A02

Local fluid shifts and edema in humans during simulated microgravity is studied. Recent results and significance and future plans on the following research topics are discussed: mechanisms of headward edema formation during head-down tilt; postural responses of head and foot microcirculations and their sensitivity to bed rest; and transcapillary fluid transport associated with lower body negative pressure (LBNP) with and without saline ingestion. CASI

N94-12004*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HORMONAL REGULATION OF FLUID AND ELECTROLYTE METABOLISM IN ZERO-G AND BEDREST
JOAN VERNIKOS *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 121-139 Apr. 1991
(Contract RTOP 199-14-12-03)
Avail: CASI HC A03/MF A02

The study of man in spaceflight has consistently indicated changes in fluid and electrolyte balance. Sodium (Na), Potassium (K), and Calcium (Ca) excretion are increased, accompanied by changes in the levels and responsiveness of adrenal hormones and the sympathetic nervous system (SNS). These hormones and neurohumors are critical to the regulation of blood pressure, blood

flow, and blood volume. The primary objectives of the research conducted under this task have been to use -6 deg head down bedrest (BR) as the analog to spaceflight, to determine the long term changes in these systems, their relationship to orthostatic tolerance, and to develop and test suitable countermeasures.
Author (revised)

N94-12005*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HORMONAL REGULATION OF FLUID AND ELECTROLYTE METABOLISM DURING PERIODS OF HEADWARD FLUID SHIFTS
LANNY C. KEIL, W. B. SEVERS (Pennsylvania State Univ., University Park.), T. THRASHER (California Univ., San Francisco.), and D. J. RAMSAY (California Univ., San Francisco.) *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 141-144 Apr. 1991
Avail: CASI HC A01/MF A02

In the broadest sense, this project evaluates how spaceflight induced shifts of blood and interstitial fluids into the thorax affect regulation by the central nervous system (CNS) of fluid-electrolyte hormone secretion. Specifically, it focuses on the role of hormones related to salt/water balance and their potential function in the control of intracranial pressure and cerebrospinal fluid (CSF) composition. Fluid-electrolyte status during spaceflight gradually equilibrates, with a reduction in all body fluid compartments. Related to this is the cardiovascular deconditioning of spaceflight which is manifested upon return to earth as orthostatic intolerance.
Author (revised)

N94-12006*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AUTOGENIC-FEEDBACK TRAINING: A COUNTERMEASURE FOR ORTHOSTATIC INTOLERANCE
PATRICIA S. COWINGS, WILLIAM B. TOSCANO (California Univ., San Francisco.), JOE KAMIYA (California Univ., San Francisco.), NEAL E. MILLER (Yale Univ., New Haven, CT.), and THOMAS G. PICKERING (Cornell Univ., New York, NY.) *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 145-153 Apr. 1991
Avail: CASI HC A02/MF A02

NASA has identified cardiovascular deconditioning as a serious biomedical problem associated with long-duration exposure to microgravity in space. High priority has been given to the development of countermeasures for this disorder and the resulting orthostatic intolerance experienced by crewmembers upon their return to the 1g norm of Earth. The present study was designed to examine the feasibility of training human subjects to control their own cardiovascular responses to gravitational stimulation (i.e., a tilt table). Using an operant conditioning procedure, Autogenic-Feedback Training (AFT), we would determine if subjects could learn to increase their own blood pressure voluntarily.
Author (revised)

N94-12007*# Harvard Medical School, Boston, MA. Electrocardiography and Arrhythmia Labs.
CARDIOVASCULAR DYNAMICS DURING SPACE SICKNESS AND DECONDITIONING
ARY L. GOLDBERGER and DAVID R. RIGNEY *In* Krug Life Sciences, Inc., Proceedings of the First Joint NASA Cardiopulmonary Workshop p 155-163 Apr. 1991 Sponsored by NASA. Ames Research Center
(Contract NAG2-514)
Avail: CASI HC A02/MF A01

We are currently funded by NASA for the project, 'Cardiovascular Dynamics During Space Sickness and Deconditioning.' NASA has given priority to the investigation of two problems encountered in the long-term space flights currently being planned: (1) space motion sickness; and (2) cardiovascular deconditioning. We have proposed to use spectral and nonlinear dynamical analysis of heart rate data to quantify the presence of these problems and to evaluate countermeasures against them.
Author (revised)

N94-12364# Army Medical Center, Aurora, CO.
PILOT TRIAL OF POTENTIATING NORMAL HEALING OF STRESS FRACTURES USING PULSING ELECTROMAGNETIC FIELDS Final Report, 15 Jan. 1991 - 14 Jan. 1993
KENT M. KARSTETTER, RICHARD A. SHERMAN, HOWARD MAY, and PAUL SPEZIA 22 Feb. 1993 11 p Prepared for Army Medical Research and Development Command, Fort Detrick, MD
(Contract MIPR-91MM1519; DA PROJ. 3M1-62787-A-874)
(AD-A264251) Avail: CASI HC A03/MF A01

Stress fractures usually take a long time to heal, and they prevent soldiers from participating in most physical activities. About half of the trainees at Ft. Sill diagnosed with stress fractures never return to active duty. This pilot program tests the feasibility of using pulsing electromagnetic fields, such as those used to potentiate the healing of non-unions, to speed healing of stress fractures. In the first trial, the field coil was embedded in the cast to produce a magnetic field around the fracture. The unit was supposed to be used for a minimum of six weeks but, due to change in treatment policies resulting from a turnover in staff with Desert Shield, the units were only used for a few weeks. Eighteen trainees used the units in their casts, ten just had casts (the standard treatment) during the treatment period and thirty-one just had the standard treatment before the treatment period. There was no difference between number of days it took those numbers of the groups able to return to duty to do so. However, only two of the treated soldiers had MEB's while twenty of the controls did. The pilot program will continue as an unfunded study at Ft. Sill. The proposed work and new investigators were identified in the annual report to MDRC for this project dated 6 Nov. 1992.
DTIC

N94-12423# Army Aeromedical Research Lab., Fort Rucker, AL.
THE AGING MILITARY AVIATOR: A REVIEW AND ANNOTATED BIBLIOGRAPHY Final Report
LEWIS W. STONE Jan. 1993 48 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A265341; USAARL-93-11) Avail: CASI HC A03/MF A01

Studies suggest that aging is another factor which may affect performance of military pilots. Although these aviators generally are better-educated and healthier than their age peers in the general population, they, too, are subject to insidiously deteriorating physiological and sensory systems, a slowly increasing likelihood of acute pathologies, and a general slowing with age - all within the age range of military pilots. Reductions in some parameters might be offset to some degree by experience and maturity; however, age-related changes and the effects therefrom vary more oetween individuals in any age group than between the groups themselves. The real problem, though, is that we still do not know what effect, if any, age-related changes have on performance of military aviators. Neither is there a concerted effort to provide the aging pilot with a coping strategy for the approaching situation.
DTIC

N94-12832*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MEDICAL EVALUATIONS ON THE KC-135 1991 FLIGHT REPORT SUMMARY
CHARLES W. LLOYD Aug. 1993 240 p
(NASA-TM-104755; S-692; NAS 1.15:104755) Avail: CASI HC A11/MF A03

The medical investigations completed on the KC-135 during FY 1991 in support of the development of the Health Maintenance Facility and Medical Operations are presented. The experiments consisted of medical and engineering evaluations of medical hardware and procedures and were conducted by medical and engineering personnel. The hardware evaluated included prototypes of a crew medical restraint system and advanced life support pack, a shuttle orbiter medical system, an airway medical accessory kit, a supplementary extended duration orbiter medical kit, and a surgical overhead canopy. The evaluations will be used to design flight hardware and identify hardware-specific training requirements. The following procedures were evaluated: transport of an ill or

injured crewmember at man-tended capability, surgical technique in microgravity, transfer of liquids in microgravity, advanced cardiac life support using man-tended capability Health Maintenance Facility hardware, medical transport using a model of the assured crew return vehicle, and evaluation of delivery mechanisms for aerosolized medications in microgravity. The results of these evaluation flights allow for a better understanding of the types of procedures that can be performed in a microgravity environment. Author (revised)

N94-12960*# Florida Agricultural and Mechanical Univ., Tallahassee. Coll. of Pharmacy.
CALCITONIN CONTROL OF CALCIUM METABOLISM DURING WEIGHTLESSNESS Final Report
KARAM F. A. SOLIMAN 1993 6 p
(Contract NAG2-411)
(NASA-CR-193622; NAS 1.26:193622) Avail: CASI HC A02/MF A01

The main objective of this proposal is to elucidate calcitonin role in calcium homeostasis during weightlessness. In this investigation our objectives are to study: the effect of weightlessness on thyroid and serum calcitonin, the effect of weightlessness on the circadian variation of calcitonin in serum and the thyroid gland, the role of light as zeitgeber for calcitonin circadian rhythm, the circadian pattern of thyroid sensitivity to release calcitonin in response to calcium load, and the role of serotonin and norepinephrine in the control of calcitonin release. The main objective of this research/proposal is to establish the role of calcitonin in calcium metabolism during weightlessness condition. Understanding the mechanism of these abnormalities will help in developing therapeutic means to counter calcium imbalance in spaceflights. Derived from text

N94-12972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
GENDER DIFFERENCES IN ENDOCRINE RESPONSES TO POSTURE AND 7 DAYS OF 6 DEG HEAD DOWN BED REST
J. VERNIKOS, M. F. DALLMAN (California Univ., San Francisco.), L. C. KEIL, D. OHARA, and V. A. CONVERTINO (National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.) Feb. 1993 20 p
(Contract RTOP 199-18-12-09)
(NASA-TM-103991; A-93016; NAS 1.15:103991) Avail: CASI HC A03/MF A01

Endocrine regulation of fluids and electrolytes during seven days of 6 deg head down bed rest (HDBR) was compared in male (n = 8) and, for the first time, female (n = 8) volunteers. The subjects' responses to quiet standing for 2 hr before and after HDBR were also tested. In both sexes, diuresis and natriuresis were evident during the first 2-3 days of HDBR, resulting in a marked increase in the urinary Na/K ratio and significant Na retention on reambulation. After the first day of HDBR, plasma renin activity (PRA) was increased relative to aldosterone, plasma volume was decreased, and the renal response to aldosterone appeared to be appropriate. Circulating levels of arginine vasopressin (AVP), cortisol, and ACTH were unchanged during HDBR. Plasma testosterone decreased slightly on day 2 of HDBR in males. The ratio of AM ACTH to cortisol was lower in females than in males because ACTH was lower in females. Urinary cortisol increased and remained elevated throughout the HDBR in males only. There were no gender differences in the responses to 7 day HDBR, except those in the pituitary-adrenal system; those differences appeared unrelated to the postural change. The provocative cardiovascular test of quiet standing before and after bed rest revealed both sex differences and effects of HDBR. There were significant sex differences in cardiovascular responses to standing, before and after HDBR. Females had greater PRA and aldosterone responses to standing before bedrest and larger aldosterone responses to standing after HDBR than males. Cardiovascular responses to standing before and after bedrest differed markedly: arterial pressure and heart rates increased with standing before HDBR, by contrast, arterial pressure decreased, with greater increases in heart rates after HDBR. In both sexes, all hormonal responses to standing were greater after HDBR. The results show clearly that similar responses to standing as well as to HDBR occur in both sexes, but that females exhibit greater PRA and aldosterone responses than males. Author (revised)

N94-13038# Chicago Univ., IL. Dept. of Medicine.
PHASE-SHIFTING EFFECT OF LIGHT AND EXERCISE ON THE HUMAN CIRCADIAN CLOCK Annual Report, 1 Mar. 1991 - 28 Feb. 1993
EVE V. CAUTER 18 May 1993 19 p
(Contract AF-AFOSR-0222-90)
(AD-A265732; AFOSR-93-0378TR) Avail: CASI HC A03/MF A01

The aim of the present study was to determine the magnitude and direction of immediate phaseshifts of human rhythms following a single exposure to a 3-hour pulse of bright light or physical activity. The pulse of light or activity was presented under constant routine conditions and measurement of the resultant phase-shifts were performed under the same constant routine conditions on the first day following pulse presentation. Four overt rhythms that are strongly dependent on circadian timing, i.e., the rhythms of plasma cortisol, plasma TSH, plasma melatonin, and body temperature, were monitored. Based on the analysis of the TSH profiles, our findings indicate that exposure to light around the time of the minimum of body temperature results in phase-advances averaging less than one hour in magnitude. Exposure to light approximately 3 hours before the time of the minimum of body temperature results in 1-2 hour phase delays. Preliminary analyses of the melatonin profiles confirm these observations. Our findings regarding the effects of exercise are still inconclusive. DTIC

N94-13061# Wyoming Univ., Laramie.
CELLULAR MECHANISM OF TURNOVER OF THE STRESS INDUCED PROTEIN HSP 70 Annual Report, 15 Apr. 1992 - 14 Apr. 1993
NANCY PETERSEN 17 May 1993 8 p
(Contract F49620-92-J-0234)
(AD-A265723; AFOSR-93-0383TR) Avail: CASI HC A02/MF A01

Synthesis of the heat shock protein, hsp70, appears to be essential for recovery from heat and chemical stress. Both because of the role of this protein in cellular recovery from stress and because of the possibility of using levels of hsp70 synthesis or accumulation as a measurement of cellular response in stress, it is important to study the stability of hsp70. We have shown that Drosophila hsp70 decays in vitro by an autoproteolytic mechanism. Autoproteolytic decay could be part of the feedback mechanism regulating the levels of hsp70 accumulation if it occurs in vivo. To determine whether autoproteolytic decay is occurring in vivo, we propose to identify the in vivo breakdown products of hsp70 and to compare their N-terminal sequences to those of the in vitro breakdown products. Precisely the same cutting site would indicate that the same protease may be responsible for the decay in both cases. We will also determine the site of the protease activity in hsp70 for the in vitro decay. DTIC

N94-13193# Oklahoma Univ., Norman. Dept. of Psychology.
READINESS TO PERFORM TESTING: A CRITICAL ANALYSIS OF THE CONCEPT AND CURRENT PRACTICES Final Report
KIRBY GILLILAND and ROBERT E. SCHLEGEL Aug. 1993 77 p
(Contract DTFA02-92-P-23499)
(DOT/FAA/AM-93/13) Avail: CASI HC A05/MF A01

Readiness to Perform (RTP) testing has become an increasingly popular alternative to biochemical screening as a method for assessing risk factors (i.e., drug, alcohol, fatigue, etc.) in the workplace. The focus of RTP testing is on the assessment of worker performance capability prior to job engagement. Thus, RTP testing is a method of assessing the state of preparedness of workers for performing their jobs. Unfortunately, RTP testing is being distributed and applied in the workplace despite a lack of knowledge regarding its conceptual basis and use. A project that investigated the conceptual and methodological foundations of RTP testing is summarized. Based on their expertise and background in task battery research, development, and validation, the authors

explored the principles and empirical research on which the concept and methods of RTP testing appear to be based. This evaluation included literature reviews, methodological assessments, and an analysis of popular RTP measures. First, a brief review of some of the background for RTP testing is provided and the difficult task of defining RTP is attempted. Specific issues and problems in conceptualizing and implementing RTP testing are addressed. Among the numerous issues addressed are the more important comprehensive factors of determining the appropriate criteria for RTP prediction and establishing the validity of RTP through various forms of empirical research. In addition, a number of the problems associated with implementing RTP testing are presented. Some examples of these problems are: testing methodology, comparative standards, time limits in testing, general versus restricted populations, and the hidden costs of RTP testing. Finally, two supporting literature reviews of areas that form the rational foundation for RTP testing are included. One review provides a summary of some of the major computerized performance assessment batteries from which many of the current RTP measures were derived. The other review surveys research literature on the influence of selected risk factors on human performance. Author (revised)

N94-13714*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

CELLULAR TRACK MODEL FOR STUDY OF HEAVY ION BEAMS

JUDY L. SHINN, ROBERT KATZ (Nebraska Univ., Lincoln.), FRANCIS A. CUCINOTTA, JOHN W. WILSON, and DUC M. NGO (Old Dominion Univ., Norfolk, VA.) Washington Aug. 1993 15 p

(Contract RTOP 199-45-16-11)

(NASA-TP-3351; L-17231; NAS 1.60:3351) Avail: CASI HC A03/MF A01

Track theory is combined with a realistic model of a heavy ion beam to study the effects of nuclear fragmentation on cell survival and biological effectiveness. The effects of secondary reaction products are studied as a function of depth in a water column. Good agreement is found with experimental results for the survival of human T-1 cells exposed to monoenergetic carbon, neon, and argon beams under aerobic and hypoxia conditions. The present calculation, which includes the effect of target fragmentation, is a significant improvement over an earlier calculation because of the use of a vastly improved beam model with no change in the track theory or cellular response parameters. Author

N94-13757*# National Space Development Agency, Tokyo (Japan).

HEALTH MONITORING OF JAPANESE PAYLOAD SPECIALIST: AUTONOMIC NERVOUS AND CARDIOVASCULAR RESPONSES UNDER REDUCED GRAVITY CONDITION (L-0)

CHIHARU SEKIGUCHI *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 139-144 Aug. 1993

Avail: CASI HC A02/MF A03

In addition to health monitoring of the Japanese Payload Specialists (PS) during the flight, this investigation also focuses on the changes of cardiovascular hemodynamics during flight which will be conducted under the science collaboration with the Lower Body Negative Pressure (LBNP) Experiment of NASA. For the Japanese, this is an opportunity to examine firsthand the effects of microgravity of human physiology. We are particularly interested in the adaption process and how it relates to space motion sickness and cardiovascular deconditioning. By comparing data from our own experiment to data collected by others, we hope to understand the processes involved and find ways to avoid these problems for future Japanese astronauts onboard Space Station Freedom and other Japanese space ventures. The primary objective of this experiment is to monitor the health condition of Japanese Payload Specialists to maintain a good health status during and after space flight. The second purpose is to investigate the autonomic nervous system's response to space motion sickness. To achieve this, the function of the autonomic nervous system will be monitored using non-invasive techniques. Data obtained will be employed to evaluate the role of autonomic nervous system in space motion sickness and to predict susceptibility to space motion sickness. The third objective is evaluation of the adaption process of the cardiovascular system to microgravity. By observation of the hemodynamics using an echocardiogram we will gain insight on cardiovascular deconditioning. The last objective is to create a data base for use in the health care of Japanese astronauts by obtaining control data in experiment L-0 in the SL-J mission. Author (revised)

N94-13758*# Nagoya Univ. (Japan).

ENDOCRINE AND METABOLIC CHANGES IN PAYLOAD SPECIALIST (L-1)

NOBUO MATSUI *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 145-149 Aug. 1993

Avail: CASI HC A01/MF A03

The endocrine system plays an important role in the adaptation to unusual environments by secreting hormones to control metabolism. Since human beings have long evolved on the surface of the Earth under a gravity environment, the weightless environment must be quite unusual for them. The purpose of this experiment is to study the mechanisms of human adaptation to a weightless environment from endocrine and metabolic changes. Our study plan is focused on four major physiological changes which were reported during past space flights or which may be expected to occur under that condition: (1) hormone and metabolic changes associated with fluid shift; (2) bone demineralization and muscle atrophy; (3) altered circadian rhythm; and (4) stress reaction during space flight. Derived from text

N94-13759*# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

NEUROPHYSIOLOGICAL STUDY ON VISUO-VESTIBULAR CONTROL OF POSTURE AND MOVEMENT IN FISH DURING ADAPTATION TO WEIGHTLESSNESS

SHIGEO MORI *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 151-153 Aug. 1993

Avail: CASI HC A01/MF A03

We can stand upright and walk smoothly without paying any particular attention to it. This is because we have established in ourselves an integration center that controls our body subconsciously in response to input from eyes, muscles, joints, foot soles, and also from the gravity sensor in the inner ear (the otolith organ). It has been shown that the cerebellum plays an important role for the establishment of the integration center and that the control pattern is comparable to that of a highly sophisticated computer system. The programming for the control, however, may well be acquired for the 1-g ground condition and does not cover the 0-g in space. Although each of the above organs function as it does on the ground, the signal pattern sent to the center must be different under 0-g and, in addition, complementary signals from the otolith organ are missing, leading to confusion in the integration center and causing a variety of symptoms similar to those of car-sickness or sea-sickness. After exposure to microgravity an immediate process of re-programming will begin and be completed in 2-4 days. There is strong supporting evidence for this sensory conflict theory as an explanation for space motion sickness (SMS) episodes. Fish were selected as test organisms for this investigation because they swim around freely in three dimensions and have well-developed organs for vision and gravity detection. They also have an innate nature to orient their back toward a light source. Actually, on the ground, the fish tilts its vertical axis toward the light when illuminated laterally, and the tilt angle is a function of the intensity of light and the magnitude of gravity, while its posture is completely light-dependent in the low-gravity environment produced by aircraft parabolic flight or when the otolith organs are removed. This implies that fish posture is entirely under visual and otolithic control. In this case, the cerebellum will also contribute to the control. In the space shuttle experiment, two fish (one with otolith-removed and the other with intact otoliths) are onboard for 7 days. The arrangement of the experiment is shown. Lamps illuminate each fish alternately from different directions at a duration of 20 seconds

for 10 minutes totally, twice a day. The video images and the brain waves from the cerebellum are analyzed later. If the sensory conflict theory is acceptable, then the confusion at the onset and the following recovery process will be manifested both in the light-dependent behavior and also in the cerebellar activity. In addition, there should be some variation in response between the two fish. Even if the results are positive in the present fish experiment, they would not be extensive enough to allow us to understand the complete mechanisms of SMS. However, what is currently needed is a collection of evidence based on animal experiments on which to base future investigations. Countermeasures for SMS are mandatory since SMS-induced vomiting occurring within a space suit could be fatal for a crew member during extravehicular activities. We expect that countermeasures will be developed before the space station era starts, and that the results of these studies will be applied to improving human welfare. Author (revised)

N94-13761*# Nagoya Univ. (Japan).
COMPARATIVE MEASUREMENT OF VISUAL STABILITY IN EARTH AND COSMIC SPACE (L-4)
KAZUGO KOGA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 161-163 Aug. 1993
Avail: CASI HC A01/MF A03

The frequency and the intensity of space motion sickness was reviewed and investigated. Unusual induced-gravity situations, such as rotation, linear acceleration, parallel swinging etc. were investigated as well. Visually-induced motion sensation or distorted perception were evaluated with respect to visual stability by many investigators. These studies are all concerned with the effect of gravity and the induction of motion sickness through human visual perception. Direct investigation under the microgravity situation, such as parabolic flight, Skylab, and Spacelab, was carried out. These studies focused on how human visual stability is established through various sensory afferents in specific gravity conditions. Results from these investigations indicate that sensory mismatch probably plays an important role in space motion sickness. The interaction of visual, vestibular, and somatosensory perception is smoothly coordinated under normal gravitational conditions on the Earth in our daily life. When the cooperation is destroyed or a mismatch occurs among them, motion sickness may develop not only on the Earth but also in microgravity. The latter case may be the cause of space motion sickness or space adaption syndrome. How human beings obtain visual stability even with posture changes on the ground was investigated. Visual stability can be categorized as static or dynamic. Static visual stability is concerned with orientation and dynamic stability is concerned with object motion perception. The perception of visual stability is modified by many other sensations, such as somatosensory, vestibular, and muscle tension. We will mainly focus on modifications by vestibular inputs to visual perception produced by eye movements in microgravity. The Vestibular-Oscular Reflex (VOR) is a well-known characteristic which results from the relationship between eye mobility and vestibular afferent inputs. Eye movements also modify dynamic visual perception, such as perceived object motion velocity. The VOR is constantly simulated under 1-g conditions on Earth. In fact, human beings have been habituated and 'programmed' for orientation (visual stability) in their everyday, 1-g environment. When humans are exposed to a different gravity situation, this programmed behavior must change; that is, it is reprogrammed. This is called habituation or familiarization. We hope to examine how object motion perception is perturbed and subsequently adapted in the microgravity environment. This experiment is focused on the cooperation of visual, vestibular, and somatosensory perception coordination and how it is changed or reduced in space compared to 1-g environment. We will obtain information on the coordination between eye movement and neck muscle activity by using EOG and EMG. We will also collect data from Payload Specialists using a self-diagnostic questionnaire concerned with perceptual abnormality. When each sensory input function and its integration in the higher nervous system are well-characterized, then more effective techniques to control SAS may be developed. Author (revised)

N94-13765*# Showa Univ., Tokyo (Japan).
EFFECT OF LOW GRAVITY ON CALCIUM METABOLISM AND BONE FORMATION (L-7)
TATSUO SUDA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 177-178 Aug. 1993
Avail: CASI HC A01/MF A03

Recently, attention has been focused on the disorders of bone and calcium metabolism during space flight. The skeletal system has evolved on the Earth under 1-g. Space flights under low gravity appear to cause substantial changes in bone and calcium homeostasis of the animals adapted to 1-g. A space experiment for the First Materials Processing Test (FMPT) was proposed to examine the effects of low gravity on calcium metabolism and bone formation using chick embryos loaded in a space shuttle. This space experiment was proposed based on the following two experimental findings. First, it has been reported that bone density decreases significantly during prolonged space flight. The data obtained from the US Skylab and the U.S.S.R. Salyut-6 cosmonauts have also documented that the degree of bone loss is related to the duration of space flight. Second, the US-Soviet joints space experiment demonstrated that the decrease in bone density under low gravity appears to be due to the decrease in bone formation rather than the increase in bone resorption. The purpose of our space experiment is, therefore, to investigate further the mechanisms of bone growth under low gravity using fertilized chick embryos. Author (revised)

N94-13768*# National Space Development Agency, Tokyo (Japan).
STUDY ON THE BIOLOGICAL EFFECT OF COSMIC RADIATION AND THE DEVELOPMENT OF RADIATION PROTECTION TECHNOLOGY (L-11)
SHUNJI NAGAOKA *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 189-196 Aug. 1993
Avail: CASI HC A02/MF A03

NASDA is now participating in a series of flight experiments on Spacelab missions. The first experiment was carried out on the first International Microgravity Laboratory Mission (IML-1) January 1992, and the second experiment will be conducted on the Spacelab-J Mission, First Materials Processing Test (FMPT). The equipment or Radiation Monitoring Container Devices (RMCD) includes passive dosimeter systems and biological specimens. The experiments using this hardware are designed by NASDA to measure and investigate the radiation levels inside spacecraft like space shuttle and to look at the basic effects of the space environment from the aspect of radiation biology. The data gathered will be analyzed to understand the details of biological effects as well as the physical nature of space radiation registered in the sensitive Solid-State Track Detectors (SSTD). Author (revised)

N94-13771*# Baylor Coll. of Medicine, Houston, TX. Dept. of Medicine.
MAGNETIC RESONANCE IMAGING AFTER EXPOSURE TO MICROGRAVITY
ADRIAN LEBLANC *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 209-211 Aug. 1993
Avail: CASI HC A01/MF A03

A number of physiological changes were demonstrated in bone, muscle, and blood from exposure of humans and animals to microgravity. Determining mechanisms and the development of effective countermeasures for long-duration space missions is an important NASA goal. Historically, NASA has had to rely on tape measures, x-ray, and metabolic balance studies with collection of excreta and blood specimens to obtain this information. The development of magnetic resonance imaging (MRI) offers the possibility of greatly extending these early studies in ways not previously possible; MRI is also non-invasive and safe; i.e., no radiation exposure. MRI provides both superb anatomical images for volume measurements of individual structures and quantification of chemical/physical changes induced in the examined tissues. This investigation will apply MRI technology to measure muscle, intervertebral disc, and bone marrow changes resulting from exposure to microgravity. Author (revised)

N94-13772*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COUNTERMEASURE FOR REDUCING POST-FLIGHT ORTHOSTATIC INTOLERANCE: LOWER BODY NEGATIVE PRESSURE (LBNP) EXPERIMENT E140
JOHN B. CHARLES *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 213-222 Aug. 1993
Avail: CASI HC A02/MF A03

Investigators have shown that after 1-2 weeks of bed rest ingestion of 1000 ml of a salt water solution during 4 hours of continuous exposure to 30 mm Hg of lower body negative pressure will protect plasma volume and orthostatic function for up to 24 hours. We hypothesize that a similar countermeasure will reduce the effects of fluid loss induced by headward fluid shift during space flight. The objective of this flight experiment is to evaluate the efficacy of the proposed countermeasure in reversing these effects on the cardiovascular system. Lower Body Negative Pressure (LBNP) involves exposing the legs and lower abdomen to reduced air pressure. The LBNP device is an air-tight chamber that seals the subject's waist to enclose the lower body. As used in this experiment, LBNP provides both the candidate treatment as well as the means of assessing the effectiveness of the treatment. Author (revised)

N94-13773*# Saint Louis Univ., MO. School of Medicine.
BONE CULTURE RESEARCH
NICOLA C. PARTRIDGE *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 223-226 Aug. 1993
Avail: CASI HC A01/MF A03

The experiments described are aimed at exploring PTH regulation of production of collagenase and protein inhibitors of collagenase (tissue inhibitors of metalloproteases, TIMP-1 and -2) by osteoblast-like osteosarcoma cells under conditions of weightlessness. The results of this work will contribute to information as to whether a microgravity environment alters the functions and responsiveness of the osteoblast. The objectives of the Bone Culture Research (BCR) experiment are: to observe the effects of microgravity on the morphology, rate of proliferation, and behavior of the osteoblastic cells, UMR 106-01; to determine whether microgravy affects the hormonal sensitivity of osteroblastic cells; and to measure the secretion of collagenase and its inhibitors into the medium under conditions of microgravity. The methods employed will consist of the following: the osteoblast-like cells, UMR-106-01 will be cultured in four NASDA cell culture chambers; two chambers will be subjected to microgravity on SL-J; two chambers will remain on the ground at KSC as ground controls but subjected to an identical set of culture conditions as on the shuttle; media will be changed four times; twice the cells will receive the hormone parathyroid hormone-related protein (PTHrP) and media collected; cells will be photographed under conditions of microgravity; and media and photographs will be analyzed upon return to determine whether functions of the cells changed. Author (revised)

N94-13774*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AUTOGENIC FEEDBACK TRAINING EXPERIMENT: A PREVENTATIVE METHOD FOR SPACE MOTION SICKNESS
PATRICIA S. COWINGS *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 227-248 Aug. 1993
Avail: CASI HC A03/MF A03

Space motion sickness is a disorder which produces symptoms similar to those of motion sickness on Earth. This syndrome has affected approximately 50 percent of all astronauts and cosmonauts exposed to microgravity in space, but it differs from what is commonly known as motion sickness in a number of critical ways. There is currently no ground-based method for predicting susceptibility to motion sickness in space. Antimotion sickness drugs have had limited success in preventing or counteracting symptoms in space, and frequently caused debilitating side effects. The objectives were: (1) to evaluate the effectiveness of Autogenic-Feedback Training as a countermeasure for space motion sickness; (2) to compare physiological data and in-flight symptom reports to ground-based motion sickness data; and (3) to predict susceptibility to space motion sickness based on pre-flight data of each treatment group crew member. Author (revised)

N94-13782*# California Univ., San Francisco.
PSYCHOPHYSIOLOGICAL INVESTIGATIONS OF THE BIOMEDICAL PROBLEMS OF MANNED SPACEFLIGHT Final Technical Report, 1 Jan. 1990 - 28 Feb. 1993
15 May 1993 4 p
(Contract NCC2-115; RTOP 199-70-12-14)
(NASA-CR-194107; NAS 1.26:194107) Avail: CASI HC A01/MF A01

The Final Report on psychophysiological investigations of the biomedical problems of manned spaceflight is presented. In the first project, statistical analyses of human autonomic data were performed. The objectives were the following: to establish a relational data base containing human psychophysiological data obtained from Shuttle flight experiments and ground-based research over a 20 year period; to enable multi-user access and retrieval of these data for subsequent analyses and for possible inclusion in the proposed Life Sciences Data Archive; and to enable/conduct statistical analyses across several experiments on large subject populations which can thereby provide definitive answers to questions on human autonomic and behavioral responses and adaptation to environmental stressors on Earth and in space. The second project studied motion sickness. The objectives were: to test/develop hardware and procedures to be incorporated into preflight training of crewmembers of Spacelab-J; and to examine spin-off applications of AFT. The third project studied orthostatic intolerance. The objective was to test the feasibility of applying autogenic-feedback training as a potential treatment for postflight orthostatic intolerance. Derived from text

N94-13824*# California Univ., San Diego. Dept. of Medicine.
RENAL FUNCTION ALTERATIONS DURING SKELETAL MUSCLE DISUSE IN SIMULATED MICROGRAVITY Final Technical Report, 1 Jan. - 31 Oct. 1992
BRYAN J. TUCKER 31 Oct. 1992 5 p
(Contract NCC2-556)
(NASA-CR-194258; NAS 1.26:194258) Avail: CASI HC A01/MF A01

This project was to examine the alterations in renal functions during skeletal muscle disuse in simulated microgravity. Although this area could cover a wide range of investigative efforts, the limited funding resulted in the selection of two projects. These projects would result in data contributing to an area of research deemed high priority by NASA and would address issues of the alterations in renal response to vasoactive stimuli during conditions of skeletal muscle disuse as well as investigate the contribution of skeletal muscle disuse, conditions normally found in long term human exposure to microgravity, to the balance of fluid and macromolecules within the vasculature versus the interstitium. These two projects selected are as follows: investigate the role of angiotensin 2 on renal function during periods of simulated microgravity and skeletal muscle disuse to determine if the renal response is altered to changes in circulating concentrations of angiotensin 2 compared to appropriate controls; and determine if the shift of fluid balance from vasculature to the interstitium, the two components of extracellular fluid volume, that occur during prolonged exposure to microgravity and skeletal muscle disuse is a result, in part, to alterations in the fluid and macromolecular balance in the peripheral capillary beds, of which the skeletal muscle contains the majority of recruitment capillaries. A recruitment capillary bed would be most sensitive to alterations in Starling forces and fluid and macromolecular permeability. Author (revised)

N94-13847# Alberta Univ., Edmonton. Dept. of Mechanical Engineering.
TRANSCRIPT OF WORKSHOP ON MACHINERY HEALTH MONITORING
A. CRAGGS, ed., R. J. ROGERS, ed. (New Brunswick Univ., Fredericton.), and T. N. MOORE, ed. (Queens Univ., Kingston,

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Ontario.) Mar. 1992 75 p Workshop held in Calgary, Alberta, 27 Sep. 1988 Sponsored by National Research Council of Canada, Ottawa, Ontario
(IME-MET-TR-005; NRC-33557; CTN-93-60783) Avail: CASI HC A04/MF A01

At a workshop on machinery health monitoring, 15 speakers presented short, prepared talks on topics including vibration monitoring, plant machinery diagnostics, use of test equipment and interpretation of results, economic benefits of monitoring, expert systems, bearings, research programs, sensors, vibration frequency spectral analysis, vibration reduction, liner cavitation damage in engines, predictive and preventive maintenance, standards, and training. After the prepared talks, a free-ranging discussion explored the points introduced in the formal presentations and also addressed additional areas of concern. A transcript of the prepared talks and discussion session is presented. CISTI

N94-14043# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Inst. fuer Flugmedizin.
CIRCADIAN RHYTHMS DURING SIMULATION OF THE D2-SPACEFLIGHT Ph.D. Thesis - Tech. Hochschule Aachen [ZIRKADIANE RHYTHMIK BEI DER SIMULATION DES D-2-WELTRAUMFLUGES]
HENNING ALLMERS Sep. 1992 148 p In GERMAN
(ISSN 0939-2963)
(DLR-FB-92-27; ETN-93-93958) Avail: CASI HC A07/MF A02

Eight subjects were isolated from the outside world for 26 days, during which two time zone shifts were performed and seven days of six degree down tilt were achieved simulating weightlessness. The results show that the method to achieve time zone change by gradually shortening the day for one hour over a period of seven days is a valid procedure to accomplish a seven hour time zone shift in a easterly direction for some body functions such as heat rate and sodium excretion. Other parameters such as temperature and hydroxylmelatoninsulfate excretion only adapted during weightlessness simulation. The results show that the method did not achieve ideal adaptation of all circadian rhythms in the evaluated parameters at the simulated spaceflight launch date. ESA

N94-14141 Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
DCIEM: THE FIRST FIFTY YEARS, 1939-1989
1989 112 p
(CTN-93-60767) Avail: CASI HC A06

Canada's Department of National Defence established the Associate Committee on Aviation Medical Research in 1939 and laboratory studies in pressure physiology began in Toronto. In 1940, research efforts were expanded with the formation of the No. 1 Clinical Investigation Unit, where a low-temperature low-pressure chamber was constructed to support research on human capabilities under cold and high-altitude conditions. The Unit was also the site of the first human centrifuge in the allied countries, which was used to develop the world's first anti-G flying suit to go into service. After the war, research in aviation medicine continued at the universities and at the Unit, now renamed the Royal Canadian Air Force Institute of Aviation Medicine. In 1968, this institute was again renamed to become the Canadian Forces Institute of Environmental Medicine (CFIEM). In 1971, CFIEM was merged with Defense Research Establishment Toronto to form the Defense and Civil Institute of Environmental Medicine (DCIEM). The history of DCIEM and its forerunners is presented in pictorial form, showing highlights of research activities and research facilities. Author (CISTI)

N94-14412* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 379)
Sep. 1993 106 p
(NASA-SP-7011(379); NAS 1.21:7011(379)) Avail: CASI HC A06

This bibliography lists 305 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System during Sep. 1993. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N94-14860# European Space Agency, Paris (France).
PHYSICAL COUNTERMEASURES FOR LONG-TERM MANNED SPACE FLIGHTS
A. GUEELL, G. TALLARIDA, H. WEGMANN, and C. BARRON, ed. Feb. 1993 93 p
(ISSN 0379-6566)
(ESA-SP-1160; ISBN-92-9092-077-7; ETN-93-94409) Copyright Avail: CASI HC A05/MF A01

The physiological data that provide the most accurate description of the medical problems encountered during long term space flight, and data indicating a need for countermeasures to ameliorate the safety of astronauts, are ascertained. Ground studies that will best serve as a basis for future flight protocols are discussed. Physical countermeasures used during past safe flights are listed and new approaches are proposed. The need for long term bed rest studies necessary to gain more fundamental knowledge about the adaptive processes that occur during weightlessness, and to validate the ability of various proposed countermeasures to counteract these mechanisms is indicated. ESA

N94-14879# Naval Medical Research Inst., Bethesda, MD.
THYROID ALTERATIONS IN PORCINE AFTER PROLONGED EXPOSURE TO COLD OR HEAT
BRUCE A. YOUNG, SARAH J. COSGROVE, and ROBERT J. CHRISTOPHERSON 1992 28 p
(Contract DA PROJ. MM3-3-C-30)
(AD-A266840; NMRI-92-130) Avail: CASI HC A03/MF A01

Studies by the Naval Medical Research Institute on humans after prolonged Antarctic residence have shown possible intracellular thyroid hormone alternations. These studies demonstrated a rise in serum clearance of orally administered triiodothyronine (T3), T3 production, and T3 total volume distribution in naval personnel after a 42 week residence in Antarctica compared to a control period in California. The increased serum clearance and total pool of T3 indicated a possible intracellular response which could not be further investigated using human subjects. An animal model permitted prolonged confinement of subjects in temperature controlled chambers and the use of radioisotopes to label T3. DTIC

N94-14916# Naval Medical Research Inst., Bethesda, MD.
AN APPARATUS FOR MEASURING THE BIOLOGICAL OXIDATION OF HYDROGEN GAS UNDER HYPERBARIC CONDITIONS
S. R. KAYAR, G. S. GOEHRING, W. E. LONG, JR., and A. L. HARABIN Jun. 1993 35 p
(Contract DA PROJ. MR0-4101)
(AD-A266834; NMRI-93-38) Avail: CASI HC A03/MF A01

An apparatus was designed, constructed, and operated to permit us to expose mammalian tissues to high pressures and concentrations of hydrogen (H2), using the radioisotope tritium (T2) as a label. As part of a study of H2 as a breathing gas for deep diving, it was necessary to determine if mammalian tissues have a latent capacity to metabolize H2 that is only evident under hyperbaric conditions. The apparatus was designed to store up to 1 Curie T2 between experiments, mix T2 and H2 with air in the experimental chamber without producing an explosive mixture, and reclaim the T2 at the end of the experiment for safe disposal. The T2 was purchased in glass ampules. Storage of T2 was accomplished by placing the T2 ampule in a steel pressure chamber and breaking the ampule to release the T2 under complete containment. The potential problems from explosivity were solved by diluting the T2 and H2 with helium. Reclamation of the T2 was accomplished by passing a controlled stream of the T2 and H2

along with a controlled stream of air through a combustion trap. DTIC

N94-14917# Letterman Army Inst. of Research, San Francisco, CA. Military Trauma Research Div.
A MATHEMATICAL MODEL FOR THE STUDY OF HEMORRHAGIC SHOCK AND FLUID RESUSCITATION: THE SYSTEMIC AND PULMONARY VASCULATURE Final Report No. 479
TAMMY J. DOHERTY Jun. 1993 24 p
(AD-A266835) Avail: CASI HC A03/MF A01

In systemic and pulmonary circuit models, the number and configuration of vascular compartments may affect predictions of vascular volume and blood flow. Various models of the pulmonary and systemic vascular circuits are considered to identify models appropriate for studies of hemorrhage and fluid resuscitation. It was found that at least one pulmonary vascular compartment, made up of one resistance and one capacitance element, was required to describe the response of pulmonary blood volume to changes in pulmonary inflow rate (i.e., right heart output). Incorporation of additional pulmonary vascular segments did not alter predictions of pulmonary volume or flow rate. Therefore, one lumped pulmonary vascular compartment appears to be sufficient. It may be necessary to incorporate multiple pulmonary vascular segments, however, for studies of pulmonary transcapillary exchange or cardiovascular control. The initial model for the systemic circuit included a separate capillary compartment for studies of transcapillary exchange as well as variable resistance and compliance elements for studies of cardiovascular control. Model identification for the systemic circulation focused on the most appropriate number of parallel vascular pathways for predicting the response of systemic outflow (i.e., venous return) to changes in systemic inflow (i.e., left heart output). At least two separate parallel pathways were required to predict systemic outflow rate because of differences in the distribution time constant between skeletal muscle and other vascular beds. DTIC

N94-14923# FORSS, Inc., Naperville, IL.
VALIDATION OF RESPIRATORY INDUCTIVE PLETHYSMOGRAPHY FOR MEASURING EXERCISE TIDAL VOLUMES Final Report, Nov. 1991 - Jun. 1992
DAVID M. CARETTI, PAUL V. PULLEN, LESLIE A. PREMO, and WADE D. KUHLMANN May 1993 25 p
(AD-A266883; ERDEC-TR-078) Avail: CASI HC A03/MF A01

This study validated the accuracy of tidal volume (V(sub T)) measurements obtained with a respiratory inductive plethysmograph (RIP) to determine its reliability for measuring ventilation during studies of exercise and respirator wear. Values from the RIP were compared with simultaneous flowmeter volumes in 8 healthy subjects at 5 incremental work rates (60, 90, 120, 150, and 180 W) of cycling and treadmill exercise. During cycling, average RIP and flowmeter values did not differ significantly at work rates below 180 W for 5 of the 8 subjects. Average RIP and flowmeter V(sub T) were similar at work rates below 150 W for 5 of the 6 subjects who completed the treadmill iteration. The variability in these results may be attributed to several factors including RIP calibration errors and slippage of the RIP elastic bands containing the inductive coils. Correlations of breath-by-breath flowmeter and RIP V(sub T) were significant for each subject during cycling and treadmill exercise. These findings suggest that the RIP can provide reliable, noninvasive measurements of ventilation during exercise with and without respirator wear. Author (revised)

N94-14943 Naval Health Research Center, San Diego, CA.
SLEEP MANAGEMENT USER'S GUIDE FOR SPECIAL OPERATIONS PERSONNEL Final Report
PAUL NAITOH and TAMSIN KELLY Jul. 1992 47 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A267746; NHRC-92-28) Avail: CASI HC A03

The objective of sleep logistics is to ensure that fighting men and women at all levels obtain sufficient sleep to maintain combat effectiveness. Special warfare missions frequently involve night work and arduous operational schedules. This User's Guide explains selected sleep management techniques for use during military operations, with particular emphasis on special operations mission. The guide will assist field commanders in using sleep logistics to prevent compromise of mission accomplishment due to sleep deprivation. In addition, it provides techniques for assessing severity of sleep debt and compensating for its ill effects. DTIC

N94-14952# Army Aeromedical Research Lab., Fort Rucker, AL.
MONOGRAPH OF THE AVIATION EPIDEMIOLOGY DATA REGISTER FOR FY 1991 Final Report
ROBERT H. SCHRIMSHER and S. G. SHANNON Jan. 1993 117 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A266896; USAARL-93-12) Avail: CASI HC A06/MF A02

The purpose of this monograph was to provide descriptive statistics within the Aviation Epidemiology Data Register (AEDR) of selected variables from an aviator's annual class 2 or class 2A Flying Duty Medical Examination (FDME) that was performed in 1991. Only aviators from a major Army component were considered, active duty, reserve, or National Guard. Descriptive data are presented in tables, which normally are defined by component, age group, and gender. Due to the small number of female aviators, some of the age-group cells are sparsely populated, especially within the reserve component. The data were organized into three areas: laboratory/clinical, vision, and hearing. Within the laboratory/clinical area, age was correlated with increases in mean values and percentages of population with values over a threshold for systolic and diastolic blood pressure, pulse, and cholesterol. Within the vision area, the likelihood of corrective lens use increased with age. For males, visual acuity decreased for both distant and near vision. DTIC

N94-15180# East Carolina Univ., Greenville, NC. School of Medicine.
EVALUATION OF DRIED STORAGE OF PLATELETS FOR TRANSFUSION: PHYSIOLOGIC INTEGRITY AND HEMOSTATIC FUNCTIONALITY Triannual Report No. 1, 1 Feb. - 3 May 1993
ARTHUR P. BODE 28 Jun. 1993 5 p
(Contract N00014-92-J-1244)
(AD-A266958) Avail: CASI HC A01/MF A01

In the last report period, we received a statement of rejection of claims from the U.S. Patent Office on our filing of May 1992 for use of lyophilized platelets in continuation-in-part (CIP) response which included aspects of applications of lyophilized platelets in wound healing. The CIP added much new data to strengthen the prior claims and listed others related to activity of platelet-derived growth factor (PDGF) expressed by freeze-dried platelets as an adjunct application in surface dressings. DTIC

N94-15250* National Aeronautics and Space Administration, Washington, DC.
COOL SUIT (Videotape)
Feb. 1988 Videotape: 3 min. 5 sec. playing time, in color, with sound
(NASA-TM-109639; NONP-VT-93-190437) Avail: CASI VHS A01/BETA A22

This video explains how a boy born with no sweat glands now lives a relatively normal life. CASI

N94-15253* National Aeronautics and Space Administration, Washington, DC.
NEW INSULIN PUMP (Videotape)
Feb. 1988 Videotape: 3 min. 30 sec. playing time, in color, with sound
(NASA-TM-109642; NONP-VT-93-190440) Avail: CASI VHS A01/BETA A22

This video details the Programmable Implant Medicine Monitoring System. CASI

N94-15271* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
GSFC FUN RUN (Videotape)
Oct. 1988 Videotape: 10 min. playing time, in color, with sound
(NASA-TM-109587; NONP-VT-93-190385) Avail: CASI VHS A01/BETA A22

This video shows Goddard's commitment to it's employees physical well-being by highlighting the Spring 1988 Goddard Fun Run. CASI

N94-15309* National Aeronautics and Space Administration. Washington, DC.
SPACE ADAPTATION (Videotape)
May 1991 Videotape: 3 min. 15 sec. playing time, in color, with sound
(NASA-TM-109601; NONP-VT-93-190399) Avail: CASI VHS A01/BETA A22

This videotape discusses space adaptation syndrome and a training simulator that may help astronauts adjust to microgravity before space flight. CASI

N94-15312* National Aeronautics and Space Administration. Washington, DC.
LASER ARTERY REPAIR (Videotape)
Apr. 1985 Videotape: 3 min. 51 sec. playing time, in color, with sound
(NASA-TM-109604; NONP-VT-93-190402) Avail: CASI VHS A01/BETA A22

This videotape demonstrates the capabilities of the excimer laser and the angioscope for treating heart disease. CASI

N94-15368* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
LIVING WELL IN SPACE: MONITORING ENVIRONMENT (Videotape)
Jul. 1989 Videotape: 9 min. 45 sec. playing time, in color, with sound
(NASA-TM-109537; NONP-VT-93-190334) Avail: CASI VHS A01/BETA A22

This video describes the Environmental Health Systems (EHS). Progress in experiments concerning water quality, toxicology, microbiology, and radiation are addressed. CASI

N94-15369* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
LIVING WELL IN SPACE: ENSURING CREW CAPABILITY (Videotape)
Jul. 1989 Videotape: 7 min. 45 sec. playing time, in color, with sound
(NASA-TM-109538; NONP-VT-93-190335) Avail: CASI VHS A01/BETA A22

This video describes the Exercise Countermeasure Facility (ECF). The ECF provides a comprehensive exercise program to allow astronauts to remain physically fit during extended stays in space. Featured are the Exercise Development Laboratory, the Exercise Physiology Laboratory, the Anthromorphic and Biomechanical Laboratory, and the Artificial Intelligence Laboratory. CASI

N94-15370* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
LIVING WELL IN SPACE: CLINICAL CARE CHALLENGE (Videotape)
Jul. 1989 Videotape: 9 min. 15 sec. playing time, in color, with sound
(NASA-TM-109539; NONP-VT-93-190336) Avail: CASI VHS A01/BETA A22

This video describes the Health Maintenance Facility (HMF). The HMF provides inflight medical care including prevention, diagnosis, and care during transport if the patient must be evacuated. A comparison to medical services found in a large hospital is used to describe the HMP's subsystems. CASI

N94-15381* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-32 CREW TRAINING FOR LOWER BODY NEGATIVE PRESSURE UNIT AND AFE (Videotape)
Nov. 1989 Videotape: 13 min. playing time, in color, with sound
(NASA-TM-109475; NONP-VT-93-190272) Avail: CASI VHS A01/BETA A22

Astronauts Dunbar, Ivins, and Low are shown preparing for the checkouts of the Lower Body Negative Pressure (LBNP) and American Flight Echocardiograph (AFE) tests. Dunbar gets into the LBNP suit, while technicians look on. Experiments on Dunbar are conducted while other crew members and technicians record data. CASI

N94-15457* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ANSWERING THE SPACE MEDICINE CHALLENGE (Videotape)
Aug. 1988 Videotape: 15 min. playing time, in color, with sound
(NASA-TM-109511; NONP-VT-93-190308) Avail: CASI VHS A01/BETA A22

The development of the Space Station Health Maintenance Facility (HMF) is featured. The HMF will provide necessary inflight medical care, including prevention, diagnosis, treatment, and care during transport if the patient must be evacuated from Space Station. CASI

N94-15537*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AUTOGENIC-FEEDBACK TRAINING (AFT) AS A PREVENTIVE METHOD FOR SPACE MOTION SICKNESS: BACKGROUND AND EXPERIMENTAL DESIGN
PATRICIA S. COWINGS and WILLIAM B. TOSCANO (California Univ., Los Angeles.) Aug. 1993 16 p Sponsored by NASA, Washington
(Contract RTOP 199-70-12-14)
(NASA-TM-108780; A-93095; NAS 1.15:108780) Avail: CASI HC A03/MF A01

Finding an effective treatment for the motion sickness-like symptoms that occur in space has become a high priority for NASA. The background research is reviewed and the experimental design of a formal life sciences shuttle flight experiment designed to prevent space motion sickness in shuttle crew members is presented. This experiment utilizes a behavioral medicine approach to solving this problem. This method, Autogenic-Feedback Training (AFT), involves training subjects to voluntarily control several of their own physiological responses to environmental stressors. AFT has been used reliably to increase tolerance to motion sickness during ground-based tests on over 200 men and women under a variety of conditions that induce motion sickness, and preliminary evidence from space suggests that AFT may be an effective treatment for space motion sickness as well. Proposed changes to this experiment for future manifests are included.
Author (revised)

N94-15634# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
EXPERIMENTAL EVALUATION OF AN ADAPTIVE FOCUSING ALGORITHM FOR A MICROWAVE PLANAR PHASED-ARRAY HYPERTHERMIA SYSTEM AT UCSF
ALAN J. FENN, CHRIS J. DIEDERICH, and PAUL R. STAUFFER 17 May 1993 52 p
(Contract F19628-90-C-0002)
(AD-A267004; TR-977; ESC-TR-92-203) Avail: CASI HC A04/MF A01

An adaptive focusing microwave planar phased-array hyperthermia system for improved heating of superficial tumors is experimentally investigated. A commercial microwave hyperthermia planar phased-array antenna system at the University of California at San Francisco (UCSF) Radiation Oncology Department has been modified to implement a gradient-search adaptive focusing algorithm. Adaptive focusing measurements in a muscle-equivalent liquid phantom with a 915-MHz microwave planar phased-array hyperthermia system comprising 16 independent

amplitude/phase-controlled waveguide antenna elements (Microtherm-1000, Labthermics Technologies, Inc.) are reported. An electric-(E-)-field feedback probe detector, fabricated at UCSF, measures the E-field generated by the hyperthermia phased array. A method of steepest-ascent gradient-search feedback algorithm, implemented in software, controls the hyperthermia array phase shifters and focuses the transmitted radiation beam. In 10 to 15 iterations, the measured phantom data indicate rapid convergence of the adaptive focusing algorithm and significant increase of the focal region field strength due to the adaptive focusing. Two-dimensional E-field radiation pattern measurements were collected by scanning the E-field dipole probe antenna inside the muscle-equivalent liquid phantom. The measured, adaptively phase-focused radiation pattern data indicate a maximum useful heating depth of about 3 cm in a muscle-equivalent sugar/saline phantom having dielectric losses of 3 dB/cm. DTIC

N94-15658*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

TOXIC SUBSTANCES REGISTRY SYSTEM: INDEX OF MATERIAL SAFETY DATA SHEETS

Oct. 1993 915 p

(NASA-TM-109332; NAS 1.15:109332; GP-23-1) Avail: CASI HC A99/MF A10

The Material Safety Data Sheets (MSDS's) listed in this index reflect product inventories and associated MSDS's which were submitted to the Toxic Substances Registry database maintained by the Base Operations Contractor at the Kennedy Space Center. The purpose of this index is to provide KSC government, contractor, and tenant organizations a means to access information on the hazards associated with these chemicals. The Toxic Substance Registry Service (TSRS) was established to manage information dealing with the storage and use of toxic and otherwise hazardous materials at KSC. As a part of this service, the BOC Environmental Health Services maintains a central repository of MSDS's which were provided to TSRS. The data on the TSRS are obtained from NASA, contractor, and tenant organizations who use or store hazardous materials at KSC. It is the responsibility of these organizations to conduct inventories, obtain MSDS's, distribute Hazard Communication information to their employees, and otherwise implement compliance with appropriate Federal, State, and NASA Hazard Communication and Worker Right-to-Know regulations and policies. Author (revised)

N94-15660# Columbia Univ., New York, NY.

DIFFUSIBLE DRIVING AND COUPLING SIGNALS OF THE BIOLOGICAL CLOCK Annual Report, 1 Apr. 1992 - 31 Mar. 1993

RAE SILVER and JOSEPH LESAUTER 18 May 1993 12 p

(Contract F49620-92-J-0195)

(AD-A267046; AFOSR-93-0548TR) Avail: CASI HC A03/MF A01

It is well established that the mammalian suprachiasmatic nucleus (SCN) is a biological pacemaker which entrains the activity of organisms to their environment and controls circadian rhythmicity. However, neither the nature of these coupling signal(s) from the SCN, nor their target(s) in the brain are well understood. Fiber efferents from the SCN reach nearby hypothalamic regions, suggesting a coupling role for neural efferent pathways. The SCN produces diffusible signals that reach nearby hypothalamic sites and the cerebrospinal fluid, suggesting a role for a diffusible efferent pathway. We consider the possibility of redundant coupling signals of the SCN and review evidence suggesting that diffusible elements may-be sufficient to sustain locomotor rhythmicity in adult animals and to restore locomotor rhythmicity in lesioned hamsters bearing SCN grafts. We also provide data for the occurrence of signals that synchronize oscillators irrespective of initial phase. The distinct role of neural and diffusible SCN coupling signals and the role of SCN-driven systems (pineal melatonin rhythms, body temperature) remains to be explored. DTIC

N94-15663# Army Research Inst. of Environmental Medicine, Natick, MA.

ANNUAL HISTORICAL REPORT, CALENDAR YEAR 1992

Apr. 1993 152 p

(AD-A267050) Avail: CASI HC A08/MF A02

This report contains information concerning the mission, organization, key staff, overall funding and significant research accomplishments of the US Army Research Institute of Environmental Medicine, a subordinate element of the US Army Medical Research and Development Command, for calendar year 1992. Also included are listings of published reports, abstracts, presentations, and key briefings for each Research Division of the Institute and significant accomplishments and appointments of the professional staff. DTIC

N94-15711*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

RELIABILITY OF AUTONOMIC RESPONSES AND MALAISE ACROSS MULTIPLE MOTION SICKNESS STIMULATION TESTS

CYNTHIA S. STOUT, WILLIAM B. TOSCANO (California Univ., Los Angeles.), and PATRICIA S. COWINGS Sep. 1993 10 p Sponsored by NASA, Washington

(Contract RTOP 199-70-12-14)

(NASA-TM-108787; A-93118; NAS 1.15:108787) Avail: CASI HC A02/MF A01

There is general agreement that a high degree of variability exists between subjects in their autonomic nervous system responses to motion sickness stimulation. Additionally, a paucity of data exists that examines the variability within an individual across repeated motion sickness tests. Investigators have also examined the relationship of autonomic responses to motion sickness development. These investigations have used analyses at discrete points in time to describe this relationship. This approach fails to address the time course of autonomic responses and malaise development throughout the motion sickness test. Our objectives were to examine the reliability of autonomic responses and malaise using the final minute of the motion sickness test across five testing occasions, to examine the reliability of the change in autonomic responses and the change in malaise across five testing occasions, and to examine the relationship between changes in autonomic responses and changes in malaise level across the entire motion sickness test. Our results indicate that, based on the final minute of testing, the autonomic responses of heart rate, blood volume pulse, and respiration rate are moderately stable across multiple tests. Changes in heart rate, blood volume pulse, respiration rate, and malaise throughout the test duration were less stable across the tests. We attribute this instability to variations in individual susceptibility and the error associated with estimating a measure of autonomic gain. Author

N94-15736# Alabama Univ., Birmingham. School of Medicine.

CUMULATIVE EFFECT OF REPEATED BRIEF CEREBRAL ISCHEMIA Final Report, 1 Jun. 1992 - 31 May 1993

HOBY HETHERINGTON 31 May 1993 34 p

(Contract F49620-92-J-0362)

(AD-A267155; AFOSR-93-0459TR) Avail: CASI HC A03/MF A01

The purpose of this grant is to investigate the metabolic and physiological factors determining the extent of ischemic damage in a model of brief repetitive ischemia. The model is intended to simulate the effects of Gz induced blackout experienced by fighter pilots undergoing high gravitational stress maneuvers. To achieve this goal a rat model was developed whereby ischemia could be induced remotely (under computer regulation) by inflation of occlusive cuff about the common carotid artery of the rat. Metabolic parameters were determined by performing in vivo NMR measurements throughout the repetitive ischemic insult. The non-destructive nature of the NMR measurement permits complete time courses to be monitored in each animal thereby minimizing animal variability. NMR measurements of metabolite content are then used in conjunction with histologic evaluations of neuronal death to assess which metabolic factors have the strongest influence on ischemic damage. During the past year we have completed our studies: (1) investigating the correlations between EEG, phosphocreatine (PCr), adenosine triphosphate (ATP),

inorganic phosphate (P), pH and lactate as a function of increasing ischemic severity in our model of brief repetitive ischemia and (2) characterizing substrate utilization and lactate clearance curves using the same model. These experiments have been performed in the rat brain using the repetitive ischemia model with in vivo NMR to measure metabolite content. DTIC

N94-15740# Letterman Army Inst. of Research, San Francisco, CA.

A REVIEW OF THE EFFICACY OF 7.5 PERCENT NACL/6 PERCENT DEXTRAN-70 (HSD) IN EXPERIMENTAL ANIMALS AND HUMANS

M. A. DUBICK and C. E. WADE Jan. 1993 31 p

(AD-A266633; LAIR-IR-481) Avail: CASI HC A03/MF A01

Recent years have seen a renewed interest in the use of hypertonic-hyperoncotic solutions as plasma volume expanders for the treatment of hemorrhagic hypotension. In particular, a number of studies in experimental animals have addressed the efficacy and safety of small volume infusions of 7.5% NaCl/6% Dextran-70 (HSD). Employing models of fixed volume or fixed pressure hemorrhage, HSD has improved survival, and reversed many of the hemodynamic, hormonal, and metabolic abnormalities associated with hemorrhagic shock. In the few human field trials completed to date, HSD has been shown to be potentially beneficial in hypotensive trauma patients who require surgery or have concomitant head injury. Extensive toxicological evaluations and lack of reports of adverse effects in the human trials indicate that, at the proposed therapeutic dose of 4 ml/kg, HSD should present little risk. DTIC

N94-15741# Letterman Army Inst. of Research, San Francisco, CA.

THE RELATIONSHIP OF METALLOTHIONEIN INDUCTION TO THE HEAT SHOCK RESPONSE

J. M. YANG, P. D. BOWMAN, M. A. DEATON, S. T. SCHUSCHEREBA, and B. E. STUCK Apr. 1993 46 p

(AD-A266634; LAIR-IR-480) Avail: CASI HC A03/MF A01

Heat shock proteins (hsp's) and Metallothioneins (MT's) are sets of proteins specifically synthesized by cells in response to sublethal injury such as heat, heavy metals, or radiation. This dissertation investigated the relationship of metallothionein induction to the heat shock response. Sodium arsenite, which induces both hsp's and MT's was used to establish a model system for investigation. Electrophoresis conditions that allowed simultaneous identification and quantitation of hsp's and MT's were then developed. Identification of MT's was achieved by (S-35) cysteine and methionine labeling and (Cd-109)-binding. The results of this study indicate that MT's undergo increased synthesis following both heat shock and sodium arsenite treatment. The level of increase of MT's after heat shock was about one-tenth of the increase after sodium arsenite treatment. These results suggest that MT's are heat shock and stress proteins. DTIC

N94-15759 Naval Air Station, Pensacola, FL. Computer and Telecommunications Station.

DEVELOPMENT OF THE OMPAT NEUROPSYCHOLOGICAL/PSYCHOMOTOR PERFORMANCE EVALUATION AND OMPAT DATA AND TIMING SUPPORT PROGRAMS Annual Report, 1 Oct. 1991 - 1 Oct. 1992

KATHRYN P. WINTER and DENNIS L. REEVES 15 Oct. 1992 11 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract MIPR-91MM1504; DA PROJ. 302-63002-D-995)

(AD-A266954) Avail: CASI HC A03

The objectives of this project were as follows: (1) to create a millisecond accuracy software timer module that could be incorporated into OMPAT and other testing programs; (2) to construct a set of automated, i.e., 'computerized' OMPAT Level 1 neuropsychological and psychomotor tests with documentation that provide a standardized, clinically relevant, and rapid method for assessment of nervous system integrity; and (3) to construct a version of UTCPAB that incorporates the software timer. DTIC

N94-15845 Dayton Univ. Research Inst., OH.

FLIGHT SIMULATOR-INDUCED SICKNESS AND VISUAL DISPLAYS EVALUATION Final Report, Oct. 1989 - Jan. 1992

HAROLD D. WARNER May 1993 102 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F33615-90-C-0005)

(AD-A267019; AL/HR-TR-1993-0056) Avail: CASI HC A06

The objectives of this investigation were to compare the incidence and severity of simulator sickness associated with the use of two flight simulator visual systems and to evaluate the performance characteristics of the visual displays. The visual systems were the Display for Advanced Research and Training (DART) and the Limited Field-of-View Dome (LFOVD). Two groups of pilots served as subjects. One group consisted of active duty U.S. Air Force instructor pilots. The second group was comprised of pilots who were no longer flying military aircraft. The pilots performed a series of single-ship and formation flights, and an F-16 simulated fighter aircraft was used in conjunction with both visual systems. It was observed that both visual systems induced simulator sickness symptoms, and some of the pilots were forced to prematurely terminate the flights due to severe discomfort. For the pilots who were able to complete the flights, there was a significant increase in self reports of discomfort over time, an increase in simulator sickness symptomatology, and a decline in postural equilibrium. However, there were no differences in the incidence of simulator sickness between the two visual systems or pilot groups. The pilots recovered from the adverse effects of the simulation within 30 min following the flights. The means and medians of the pilots' ratings of the visual display characteristics indicated that the only problems encountered with the two visual systems were the resolution of the peripheral field and the vertical excursion limits of the high-resolution inset for the LFOVD. DTIC

N94-16095 Ryerson Polytechnical Inst., Toronto (Ontario).

TRANSCRANIAL DOPPLER ULTRASOUND STUDIES OF CEREBRAL BLOOD-FLOW IN MICROGRAVITY

M. S. KASSAM, R. L. BONDAR (Canadian Space Agency, Ottawa, Ontario.), K. W. JOHNSTON (Toronto Univ., Ontario.), R. S. C. COBBOLD (Toronto Univ., Ontario.), P. J. VAITKUS (Toronto Univ., Ontario.), F. STEIN (Maple Lake Non-Invasive Vascular Lab., Farmington, NM.), and P. DUNPHY *In* National Research Council Canada, Proceedings of the Second Workshop on Microgravity Experimentation 8 p 1990

Avail: Issuing Activity (National Research Council, Publication Sales and Distribution, Montreal Road, Ottawa, Ontario, K1A OR6 Canada)

Transcranial doppler ultrasound (TCD) was used to measure blood flow velocities in the middle cerebral artery of volunteers subjected to 15-20 seconds of acute microgravity in the NASA KC-135 aircraft. In addition, simultaneous recordings of acceleration in the z direction and of other systemic vascular parameters were obtained. In-flight experimental procedures and the development of a system for recording and processing a large volume of data are described. Problems in performing the experiments and in analyzing the data are noted. Results of processing seven subjects indicate a change in the quantitative indices during the flight. Of particular interest are the changes in received power of the Doppler signal and the mean flow velocity waveforms in the microgravity regions. Indices related to the mean flow of the artery appear to exhibit changes in each phase of the flight parabola that are consistent from subject to subject. Author (CISTI)

N94-16096 Institute for Space and Terrestrial Science, York (Ontario).

HUMAN OCULAR TORSION DURING PARABOLIC FLIGHT: AN INVESTIGATION USING ELECTROMAGNETIC SCLERAL SEARCH COIL

B. CHEUNG, K. MONEY (Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario.), I. HOWARD, N. KIRIENKO, W. JOHNSON (Saint Michael's Hospital, Toronto, Ontario.), L. LACKNER (Brandeis Univ., Waltham, MA.), and PAUL A. DIZIO (Brandeis Univ., Waltham, MA.) *In* National Research Council

Canada, Proceedings of the Second Workshop on Microgravity Experimentation 8 p 1990
Avail: Issuing Activity (National Research Council, Publication Sales and Distribution, Montreal Road, Ottawa, Ontario, K1A OR6 Canada)

Ocular counterrolling is a reflex rotation of the eyes about the visual axis opposite to the lateral inclination of the head. Attempts were made to measure the static and dynamic components of ocular counterrolling during the hypogravity and hypergravity phases of parabolic flight, using the electromagnetic scleral search-coil technique. The results provide evidence that torsional eye displacements occurred in response to the imposition of altered gravitoinertial forces. The torsional position of the eyes is not constant, when the subject's head position, both during upright or tilt, is maintained. In some subjects, the torsional displacement in microgravity is accompanied by a fine torsional nystagmus. Also, the direction and magnitude of the torsion differ substantially from one individual to another. There was a significant difference in torsional magnitude between the microgravity and hypergravity period in all head positions. Under 1-g condition, static counterroll compensated for about 16% of head roll while the dynamic counterpart was much larger, up to 36%. The gain of dynamic counterroll was also higher during the hypergravity phases than the microgravity phases. Author (CISTI)

N94-16000 Simon Fraser Univ., Burnaby (British Columbia). School of Kinesiology.
HEART RATE RESPONSE TO PARABOLIC FLIGHT MANOEUVRES
DARYL LEISKI, IGOR MAKJAVIC, and B. V. TRYGGVASON *In* National Research Council Canada, Proceedings of the Second Workshop on Microgravity Experimentation 9 p 1990
Avail: Issuing Activity (National Research Council, Publication Sales and Distribution, Montreal Road, Ottawa, Ontario, K1A OR6 Canada)

Some of the physiological data on heart rate response to parabolic flight maneuvers are analyzed. Data were gathered from two subjects on flights of the KC-135 aircraft over a two year period. The electrocardiogram data retrieval system and statistical analysis methods used are described. Results are presented and discussed for heart rate versus time and versus acceleration. Heart rate versus time showed no conclusive trends. The heart rate versus acceleration levels illustrated the results that were expected based on previous studies using tilt tables to alter the hydrostatic column. The heart rate changes are directly linked to the changing hydrostatic column and the resulting fluid shifts. Coupled with this bioreceptor response is the exercise reflex, a response to the static muscular contraction of the abdominal and leg muscles maintaining body posture through the high-g portions of the parabolas. Comparison of responses between the two subjects provides insight into interindividual differences in responses to the stress of parabolic flight. Author (CISTI)

N94-16113# Massachusetts General Hospital, Boston. Labs. of Photomedicine.
CENTER OF EXCELLENCE IN LASER MEDICINE
J. A. PARRISH 29 Apr. 1993 6 p
(Contract DE-FG02-91ER-61228)
(DE93-016541; DOE/ER-61228/T1) Avail: CASI HC A02/MF A01

Achievements during the last 12 months of funding to initiate a Center of Excellence in biomedical laser development include the following: seven specific research projects within the Center's three broad interest areas; and program development to establish the MGH Laser Center and its activities. Progress is reported in three areas of interest: new medical laser systems development; optical diagnostics; and photo sensitization. Feasibility studies and prototype development were emphasized, to enhance establishing a substantial Center through future support. Specific projects are outlined. In addition, the interdepartmental MGH Laser Center's activities and accomplishments are reported. DOE

N94-16478* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 378)
Aug. 1993 72 p
(NASA-SP-7011(378); NAS 1.21:7011(378)) Avail: CASI HC A04

This bibliography lists 185 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Aug. 1993. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N94-16479* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 380)
Oct. 1993 72 p
(NASA-SP-7011(380); NAS 1.21:7011(380)) Avail: CASI HC A04

This bibliography lists 192 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Oct. 1993. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N94-16515# Armed Forces Radiobiology Research Inst., Bethesda, MD.
AFRRI REPORTS, FIRST QUARTER 1993
May 1993 81 p
(Contract DA PROJ. NWE-DQAX)
(AD-A266380; AFRRI-SR93-1; AFRRI-SR93-2) Avail: CASI HC A05/MF A01

Contents include the following Armed Forces Radiobiology Research Institute reports: effects of WR-1065 and WR-151326 on survival and neoplastic transformation in C3H/10T1/2 cells exposed to TRIGA or JANUS fission neutrons; behavioral differences of irradiated persons associated with the Kyshtym, Chelyabinsk, and Chernobyl nuclear accidents; involvement of superoxide dismutase and glutathione peroxidase in attenuation of radiation induced hyperthermia; implication of nitric oxide synthase in radiation induced decrease in hippocampal noradrenaline release in rats; energy deposition in a spherical cavity of arbitrary size and composition; inhibition of c-kit ligand/steel factor by antibodies reduces survival of lethally irradiated mice; effects of combined administration of interleukin-6 and granulocyte colony stimulating factor on recovery from radiation induced hemopoietic aplasia; synergistic roles of interleukin-6, interleukin-1, and tumor necrosis factor in the adreno corticotropin response to bacterial lipo polysaccharide in vivo; electron paramagnetic resonance detection of nitric oxide-dependent spin adducts in mouse jejunum; radiolysis of dinucleoside monophosphates by high-energy electrons and fission neutrons; effects of sublethal doses of ionizing radiation; and differences in unwinding of supercoiled DNA induced by the two enantiomers of anti benzo(a)pyrene diol epoxide. DTIC

N94-16544# Letterman Army Inst. of Research, San Francisco, CA.
A MATHEMATICAL MODEL FOR THE STUDY OF HEMORRHAGIC SHOCK AND FLUID RESUSCITATION: TRANSCAPILLARY EXCHANGE Final Report, 1989 - 1993
TAMMY J. DOHERTY Mar. 1993 37 p
(AD-A266427; LAIR-477) Avail: CASI HC A03/MF A01

Mathematical models used to predict plasma volume responses to hemorrhage and fluid resuscitation must consider both fluid and solute exchange across the capillary wall. In this paper, we review four models of transcapillary exchange that might be incorporated into a compartmental model for plasma volume prediction. The simplest of the four transcapillary flux models assumes a discrete capillary wall structure, ideal solutions, and

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capillary wall homogeneity. The remaining models become progressively more complex by successive elimination of these three assumptions. To assess their effects on whole-body plasma volume predictions, the four models of transcapillary exchange were incorporated into a simple two-compartment (blood and interstitial space) model. Next, plasma volume predictions were generated for the following simulation conditions: instantaneous 25% loss of blood volume, instantaneous 50% increase in plasma NaCl concentration, instantaneous 50% increase in plasma albumin concentration, and instantaneous 25% loss of blood volume with a 50% increase in plasma NaCl concentration. Plasma volume predictions, generated by the four models, were indistinguishable over these simulation conditions. From these results, we conclude that the simplest of the transcapillary flux models may be used for predicting plasma volume responses to hemorrhage and resuscitative fluid administration. DTIC

N94-16558# Letterman Army Inst. of Research, San Francisco, CA.
A MATHEMATICAL MODEL FOR THE STUDY OF HEMORRHAGIC SHOCK AND FLUID RESUSCITATION: EXCHANGE OF FLUID AND SOLUTES BETWEEN VASCULAR, INTERSTITIAL, AND TISSUE CELL COMPARTMENTS Final Report, 1989 - 1993
TAMMY J. DOHERTY Jun. 1993 26 p
(AD-A266426; LAIR-478) Avail: CASI HC A03/MF A01

The transfer of fluid from extravascular compartments into the vasculature is an important recovery mechanism for hemorrhage. This paper describes a three-compartment model (i.e., vascular, interstitial, and tissue cell) that predicts intra-extravascular fluid exchange following hemorrhage and fluid resuscitation. This three-compartment model assumes that capillary pressure is a linear function of blood volume, that interstitial pressure is a nonlinear function of extravascular volume, and that lymph flow is a function of interstitial pressure. Starting with this simple three-compartment model, the effects of model assumptions on plasma volume predictions were assessed. By varying model assumptions and comparing plasma volume predictions, we determined that separate tissue cell and interstitial compartments were required for predicting the plasma volume response to infusions of resuscitative solutions containing small, permeable solutes (e.g., NaCl). We also determined that the interstitial space could be described by a constant hydrostatic pressure, that considerations of interstitial exclusion volumes were not required, and that lymph flow could be considered constant. Plasma volume predictions generated by the three-compartment model were also compared to observed plasma volumes for validation. DTIC

N94-16564# Letterman Army Inst. of Research, San Francisco, CA. Div. of Blood Research.
EVALUATION OF HEMOGLOBIN-OXYGEN EQUILIBRIUM BINDING BY RAPID-SCANNING SPECTROPHOTOMETRY AND SINGULAR-VALUE DECOMPOSITION
KIM D. VANDEGRIFF and RICHARD I. SHRAGER 8 Mar. 1993 21 p
(AD-A266453) Avail: CASI HC A03/MF A01

A review of a new method to measure oxygen equilibrium binding to hemoglobin solutions by rapid-scanning spectrophotometry is presented. State-of-the-art technologies are reviewed and compared. The new method is based on rapid-scanning spectrophotometry that is used to resolve directly unique optical transitions during continuous hemoglobin oxygenation. Mathematical techniques for matrix multicomponent analysis and singular value decomposition (SVD) are described, and spectral artifacts that are resolved by these sensitive techniques are discussed. DTIC

N94-16565# Letterman Army Inst. of Research, San Francisco, CA.
INCREASED VASCULAR RESISTANCE WITH HEMOGLOBIN-BASED OXYGEN CARRIERS
J. R. HESS, V. W. MACDONALD, C. S. GOMEZ, and V. COPPER 1993 13 p
(AD-A266454) Avail: CASI HC A03/MF A01

The purpose of this project was as follows: to compare the effects of resuscitation with hemoglobin-based oxygen-carriers and conventional crystalloid and colloid resuscitation fluids on hemodynamics, oxygen transport, and oxygen consumption in an animal model of the field medical use of these fluids in the treatment of hemorrhagic shock. Twenty-eight immature swine were tested in accordance with the following protocol: they were surgically prepared; allowed to recover five days; water deprived for 48 hours; hemorrhaged of 25 ml/kg over one hour; resuscitated promptly with (1) Ringer's lactate, 75 ml/kg, (2) 7% albumin in Ringer's acetate, 25 ml/kg, (3) 9% unmodified hemoglobin in Ringer's acetate, 25 ml/kg, or (4) 9% alpha alpha-crosslinked hemoglobin in Ringer's acetate, 25 ml/kg; observed with three hours of hemodynamic and oxygen transport measurements; and, finally, blood which had been removed previously was returned. DTIC

N94-16566# Letterman Army Inst. of Research, San Francisco, CA. Div. of Blood Research.
HEMOGLOBIN
KIM D. VANDEGRIFF 8 Mar. 1993 11 p
(AD-A266455) Avail: CASI HC A03/MF A01

This is a review of hemoglobin structure and function. The role of hemoglobin as the red blood cell oxygen-transport protein is outlined. The structure is defined in terms of amino acid sequence, x-ray crystallographic structure, and subunit interaction. The function is described for reversible oxygen binding, carbon dioxide, and protein mechanism. DTIC

N94-16609*# BioTechnology, Inc., Falls Church, VA.
PROCEEDINGS OF THE 1992 ANNUAL MEETING NASA OCCUPATIONAL HEALTH PROGRAM
Jul. 1993 312 p Meeting held in San Jose, CA, 30 Nov. - 4 Dec. 1992
(Contract NASW-4176)
(NASA-CR-193462; NAS 1.26:193462) Avail: CASI HC A14/MF A03

The purpose of this meeting was to exchange information across NASA facilities that is critical to agency-wide improvement in the efforts to maintain and enhance employee health. The topics covered include the following: occupational medicine, environmental health, physical fitness, and health education.

N94-16610*# Department of Energy, Washington, DC.
NEW HEALTH AND SAFETY INITIATIVES AT THE DEPARTMENT OF ENERGY (DOE)
PAUL L. ZIEMER *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 9-26 Jul. 1993
Avail: CASI HC A03/MF A03

This document touches on some of the more important lessons learned and the more noteworthy initiatives DOE has put into motion in the last three years to protect the health and safety of our contractor employees. What we have learned in the process should come as no surprise to those of you who have been working in the field: (1) that management commitment to safety and health is critical to a successful program; (2) that meaningful employee participation in all aspects of the program enhances its effectiveness at every level; and (3) that the dedication and expertise of medical and occupational safety and health professionals are needed if the challenging problems presented by the complex and technologically advanced environment at DOE facilities are to be overcome. I believe that we have made a good beginning in the long and arduous task of building an Occupational Safety and Health Program that will serve as a model for others, and I can assure you that we intend to continue our efforts to protect every worker within the complex from occupational injury and disease. Derived from text

N94-16611*# Medical Associates, Inc., Charlotte, NC.
AMERICANS WITH DISABILITIES ACT CONSIDERATIONS FOR THE PRACTICE OF OCCUPATIONAL MEDICINE

STEVEN ST.CLAIR and THEODORE SHULTS (Shults and Associates, Chapel Hill, NC.) *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 27-43 Jul. 1993
Avail: CASI HC A03/MF A03

The Americans with Disabilities Act (ADA), although developed in the context of civil rights legislation, is likely to have notable impact on the practice of occupational medicine. The ADA contains provisions limiting the use of preplacement examinations to determinations of the capability to perform the essential functions of the job and of direct threat to the health and safety of the job applicant and others. The Title 1 employment provisions of the ADA established definitions and requirements similar to those found in section 504 of the Rehabilitation Act of 1973, as amended; leading cases that have been litigated under the Rehabilitation Act, as amended, are described. The limitations of available scientific and medical information related to determinations of job capability and direct threat and ramifications of the ADA on the practice of occupational medicine are discussed. Author

N94-16613*# Monsanto Co., Luling, LA.
EMERGENCY PREPAREDNESS AND PLANNING
KENNETH BOUVIER *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 61-68 Jul. 1993
Avail: CASI HC A02/MF A03

Monsanto's emergency response plan in dealing with hazardous materials at their facilities is presented. Topics discussed include the following: CPR training; emergency medial training; incident reports; contractor injuries; hazardous materials transport; evacuation; and other industrial safety concerns. CASI

N94-16614*# Coalition to Prevent Lead Poisoning, San Francisco, CA.
LEAD POISONING: AN OVERVIEW
NEIL GENDEL *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 69-78 Jul. 1993
Avail: CASI HC A02/MF A03

A problem that should be of great concern to all of us is the lead poisoning of children. First, I would like to present a short overview concerning the reasons everyone should care about lead poisoning, then discuss the history of lead poisoning, what is happening today across the country, and the future. Author

N94-16615*# Edgerton, Germeshausen and Grier, Inc., Cocoa Beach, FL.
MEDICAL SURVEILLANCE AND BIOLOGICAL MONITORING OF LEAD EXPOSED EMPLOYEES
E. B. FERGUSON *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 79-85 Jul. 1993
Avail: CASI HC A02/MF A03

Employee health protection is an employer responsibility. The multi-faceted aspects of employee protection from the potentially harmful effects of inorganic lead sometimes stress the relationships of several employer units. These include supervision and management, safety, operations and maintenance, engineering, environmental health, environmental management, and occupational medicine. The administrative aspects of program development are discussed. The purpose is to emphasize the opportunity for cooperation by all of the employee health components in developing an optimum surveillance and protection program. Author (revised)

N94-16616*# Center for Occupational Programs for Employees, Inc., Washington, DC.
ONGOING RECOVERY BASIC INFORMATION TOOL (ORBIT)
DONALD OBERG *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 87-89 Jul. 1993
Avail: CASI HC A01/MF A03

The Federal Drug Free Work Place Program (DFWP) has now matured to the point of being able to return employees to sensitive testing designated positions (TDP) after completion of treatment of their addiction. The known tendency of addicted individuals to suffer multiple relapses prior to their final recovery has resulted in several positive urine tests (relapses) occurring among those Federal employees who have already completed treatment and who have been returned to TDP's. The very real potential for further relapses occurring after additional employees return to TDP's will be a critical factor in the ultimate success of the DFWP and in the public's impression of the program's effectiveness. In response to this concern, NASA has begun development of its Ongoing Recovery Basic Information Tool (ORBIT) instrument. The aim of the NASA ORBIT is to provide Employee Assistance Program (EAP) professionals with an advanced clinical tool which will be helpful in supporting recovery from substance abuse and which will allow more accurate determinations of when clients may be successfully returned to sensitive positions. Author (revised)

N94-16619*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
PHYSICAL FITNESS AND THE HEALTHY PEOPLE 2000 GOALS
LARRY T. WIER *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 121-142 Jul. 1993
Avail: CASI HC A03/MF A03

Healthy People 2000 is a statement of national objectives with the overall goal of improving American health. Various aspects of endeavor are discussed. Derived from text

N94-16622*# Edgerton, Germeshausen and Grier, Inc., Cocoa Beach, FL.
EFFICIENT MANAGEMENT OF CARDIOVASCULAR RISK SCREENING PROGRAMS
CAROL ROTH *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 159-165 Jul. 1993
Avail: CASI HC A02/MF A03

The Environmental Health Unit, located on-site at the the Goddard Space Flight Center (GSFC), is responsible for the implementation of the Center's Employee Environmental and Occupational Health Program. The Health Unit, Health Physics (HP), and Industrial Hygiene (IH) staffs collaborate to provide quality service to the employees at GSFC. The Health Unit staff identifies, evaluates, and ensures the control of occupational hazards on the Center. In the past, components of the Industrial Hygiene Program have included the Industrial Hygiene Health Hazard Identification Program (IHHIP), the Hearing Conservation Program (HCP), the Hazard Communication Program, and the bi-annual fume hood survey. More recently, the Environmental Health Unit has expanded its services by adding the Ergonomics Program. Various aspects of the Ergonomics Program are discussed.
Derived from text

N94-16623*# Kelsey Seybold Clinic, P.A., Houston, TX.
INDUSTRIAL HYGIENE LABORATORY ACCREDITATION: THE JSC EXPERIENCE
DAWN E. FADNER *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 167-174 Jul. 1993
Avail: CASI HC A02/MF A03

The American Industrial Hygiene Association (AIHA) is a society of professionals dedicated to the health and safety of workers and community. With more than 10,000 members, the AIHA is the largest international association serving occupational and environmental health professionals practicing industrial hygiene in private industry, academia, government, labor, and independent organizations. In 1973, AIHA developed a National Industrial Hygiene Laboratory Accreditation Program. The purposes of this program are shown. Derived from text

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N94-16625*# Edgerton, Germeshausen and Grier, Inc., Cocoa Beach, FL.
ILLNESS/INJURY PATTERN COMPLEX 40 (TITAN)
SHARON BLASDELL *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 183-188 Jul. 1993
Avail: CASI HC A02/MF A03

On July 31, 1991, EG&G Medical began providing medical support at the Titan Area Clinic (TAC). The hours of operation are 0700-2300, Monday through Friday, with Emergency Medical Services (EMS) provided 24-hours a day, seven days a week. The TAC consists of a 10 x 10 ft section of a trailer that also houses Bechtel Safety. Supplies consisted of an examining table, an eye wash chair, first aid equipment, over-the-counter medications, spine boards, a portable rescuscitator, etc. All of the nurses are Advanced Cardiac Life Support (ACLS) certified. Although the Titan Area Clinic is strictly a first-aid station with no ACLS facilities on-site, it is staffed with an Occupational Health Nurse with ACLS certification. If ACLS or additional help is needed, the nurse activates EMS by dialing 911. The nurse responds to any medical problems or emergencies on the complex, but activates EMS prior to leaving the TAC. A Bechtel Safety Representative accompanies the nurse to the site and assists as needed. Other aspects of the complex and its functions are presented.
Derived from text

N94-16627*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
TUBERCULOSIS: A CASE FOR INCREASED SCREENING
STEPHEN A. WEIRICH *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 199-210 Jul. 1993
Avail: CASI HC A03/MF A03

The topics discussed include the following: background; epidemiological shifts; pathophysiology of turberculosis; screening for turberculosis; and recommendations. Derived from text

N94-16628*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SUMMARY OF FOLLOW-UP RESULTS FROM POTENTIAL TUBERCULOSIS EXPOSURES
STEPHEN A. WEIRICH *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 211-212 Jul. 1993
Avail: CASI HC A01/MF A03

There were two isolated episodes of LeRC workers who were diagnosed with pulmonary tuberculosis (TB) during the fall of 1990. The specifics surrounding each case were very different, and it is clear that the two episodes were completely unrelated. The fact that the final diagnoses of pulmonary tuberculosis came within three weeks of each other was purely coincidental. The Occupational Medicine Service (OMS) conducted separate informational sessions and offered free PPD skin testing to all employees, both NASA and contractors, who felt that they were at risk of having been exposed to tuberculosis from either individual. The procedures and results of these are briefly discussed.
Derived from text

N94-16629*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LEGIONELLA: AN OVERVIEW
STEPHEN A. WEIRICH *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 213-219 Jul. 1993
Avail: CASI HC A02/MF A03

The topics discussed include the following: history; bacteriology, ecology, and transmission; epidemiology; clinical manifestations; Pontiac Fever; diagnosis; treatment; and prevention.
Derived from text

N94-16630*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SCREENING FOR PROSTATE CANCER
STEPHEN A. WEIRICH *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 221-223 Jul. 1993
Avail: CASI HC A01/MF A03

Despite recent advances in both the survival and cure rates for many forms of cancer, unfortunately the same has not been true for prostate cancer. In fact, the age-adjusted death rate from prostate cancer has not significantly improved since 1949, and prostate cancer remains the most common cancer in American men, causing the second highest cancer mortality rate. Topics discussed include the following: serum testosterone levels; diagnosis; mortality statistics; prostate-sppecific antigen (PSA) tests; and the Occupational Medicine Services policy at LeRC.
Derived from text

N94-16631*# National Aeronautics and Space Administration, Washington, DC.
PHYSICAL FITNESS AND HEALTH EDUCATION PROGRAM AT NASA HEADQUARTERS
CATHY ANGOTTI *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 233-235 Jul. 1993
Avail: CASI HC A01/MF A03

The topics discussed include the following: policy procedures to enter the NASA Headquarters Physical Fitness and Health Program; eligibility; TDY eligibility; health promotions offered; and general facility management. Derived from text

N94-16632*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AMES FITNESS PROGRAM
RANDY PRATT *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 237 Jul. 1993
Avail: CASI HC A01/MF A03

The Ames Fitness Program services 5,000 civil servants and contractors working at Ames Research Center. A 3,000 square foot fitness center, equipped with cardiovascular machines, weight training machines, and free weight equipment is on site. Thirty exercise classes are held each week at the Center. A weight loss program is offered, including individual exercise prescriptions, fitness testing, and organized monthly runs. The Fitness Center is staffed by one full-time program coordinator and 15 hours per week of part-time help. Membership is available to all employees at Ames at no charge, and there are no fees for participation in any of the program activities. Prior to using the Center, employees must obtain a physical examination and complete a membership package. Funding for the Ames Fitness Program was in jeopardy in December 1992; however, the employees circulated a petition in support of the program and collected more than 1500 signatures in only three days. Funding has been approved through October 1993. Author (revised)

N94-16633*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
JOHNSON SPACE CENTER HEALTH RELATED FITNESS PROGRAM
LARRY T. WIER *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 239-243 Jul. 1993
Avail: CASI HC A01/MF A03

The topics covered include the following: educational component; activity ratings; lecture topics; program evaluation; Nutrition Intervention Program; and research. CASI

N94-16634*# Bionetics Corp., Cocoa Beach, FL.
KENNEDY SPACE CENTER EXERCISE PROGRAM
CRISTY HOFFMAN *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 245-248 Jul. 1993
Avail: CASI HC A01/MF A03

The Kennedy Space Center (KSC) Fitness Program began in Feb. 1993. The program is managed by the Biomedical Operations

and Research Office and operated by the Bionetics Corporation. The facilities and programs are offered to civil servants, all contractors, temporary duty assignment (TDY) participants, and retirees. All users must first have a medical clearance. A computer-generated check-in system is used to monitor participant usage. Various aspects of the program are discussed.
Derived from text

N94-16635*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE LANGLEY FITNESS CENTER
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 249-253 Jul. 1993
Avail: CASI HC A01/MF A03

NASA Langley recognizes the importance of healthy employees by committing itself to offering a complete fitness program. The scope of the program focuses on promoting overall health and wellness in an effort to reduce the risks of illness and disease and to increase productivity. This is accomplished through a comprehensive Health and Fitness Program offered to all NASA employees. Various aspects of the program are discussed.
Derived from text

N94-16636*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PHYSICAL EXERCISE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 255-257 Jul. 1993
Avail: CASI HC A01/MF A03

The topics discussed include the following: the Marshall Space Flight Center Physical Education Program and the physical fitness and health breakout session.
CASI

N94-16637*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ARSENIC SURVEILLANCE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 261-266 Jul. 1993
Avail: CASI HC A02/MF A03

Background information about arsenic is presented including forms, common sources, and clinical symptoms of arsenic exposure. The purpose of the Arsenic Surveillance Program and LeRC is outlined, and the specifics of the Medical Surveillance Program for Arsenic Exposure at LeRC are discussed.
CASI

N94-16638*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ASBESTOS SURVEILLANCE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 267-271 Jul. 1993
Avail: CASI HC A01/MF A03

Background on asbestos is presented including the different types and the important medical distinctions between those different types. The four diseases associated with asbestos exposure are discussed: mesothelioma, lung cancer, asbestosis, and benign pleural disorders. The purpose of the LeRC Asbestos Surveillance Program is outlined, and the specifics of the Medical Surveillance Program for Asbestos Monitoring at LeRC are discussed.
Derived from text

N94-16639*# National Aeronautics and Space Administration. Lewis Research Center Cleveland, OH.
HEARING CONSERVATION MEDICAL PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 273-279 Jul. 1993
Avail: CASI HC A02/MF A03

Background on hearing impairment is presented including causes and criteria for safe noise levels. The purpose of the Hearing Conservation Program at LeRC is outlined, and the specifics of the Medical Surveillance Program for Hearing Impairment at LeRC are discussed.
CASI

N94-16640*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LEAD SURVEILLANCE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 281-289 Jul. 1993
Avail: CASI HC A02/MF A03

Background on lead exposure is presented including forms of lead, sources, hematologic effects, neurologic effects, endocrine effects, renal effects, and reproductive and developmental effects. The purpose of the Lead Surveillance Program at LeRC is outlined, and the specifics of the Medical Surveillance Program for Lead Exposure at LeRC are discussed.
CASI

N94-16641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MERCURY SURVEILLANCE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 291-295 Jul. 1993
Avail: CASI HC A01/MF A03

Background on mercury exposure is presented including forms, sources, permissible exposure limits, and physiological effects. The purpose of the Mercury Surveillance Program at LeRC is outlined, and the specifics of the Medical Surveillance Program for Mercury Exposure at LeRC are discussed.
CASI

N94-16642*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
RESPIRATORY PROTECTION PROGRAM MEDICAL CLEARANCE FOR RESPIRATOR USE
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 297-303 Jul. 1993
Avail: CASI HC A02/MF A03

Background on occupational exposure to various inhalents is discussed including on-site hazard control measures, procedures, physiological effects, and interpretation of results for the medical clearance of employee for use of personal respiratory protection devices. The purpose of the Respiratory Protection Program at LeRC is outlined, and the specifics of the Medical Surveillance Program for Respiratory Protection at LeRC are discussed.
CASI

N94-16643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
GENERAL MEDICAL SURVEILLANCE PROGRAM
In BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 305-308 Jul. 1993
Avail: CASI HC A01/MF A03

Background on the General Medical Surveillance Program at LeRC is presented. The purpose of the General Medical Surveillance Program at LeRC is outlined, and the specifics of the program are discussed.
CASI

N94-16644*# Edgerton, Germeshausen and Grier, Inc., Cocoa Beach, FL.
BLOODBORNE PATHOGENS PROGRAM
SHARON BLASDELL *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 309-311 Jul. 1993
Avail: CASI HC A01/MF A03

The final rule on the Occupational Exposure to Bloodborne Pathogens was published in the Federal Register on Dec. 6, 1991. This Standard, 29 CFR Part 1910.130, is expected to prevent 8,900 hepatitis B infections and nearly 200 deaths a year in healthcare workers in the U.S. The Occupational Medicine and Environmental Health Services at KSC has been planning to implement this standard for several years. Various aspects of this standard and its Bloodborne Pathogens Program at KSC are discussed.
Derived from text

N94-16645*# Hummer Associates, Washington, DC.
OSHA BLOODBORNE PATHOGENS STANDARDS EXPOSURE CONTROL PLAN
CARO ELISE LUHRS and RITA TEITELBAUM *In* BioTechnology,

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Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 313-327 Jul. 1993 Revised
Avail: CASI HC A03/MF A03

The Hummer Associates Exposure Control Plan is designed to reduce significant occupational exposure to bloodborne pathogens and infectious materials for Hummer Associates health care personnel. Under universal precautions, all patients and all body fluids are considered potentially infectious for bloodborne pathogens. Medical personnel need not be at increased risk if universal precautions are correctly understood and followed. This program covers all employees who could reasonably anticipate contact with blood or other potentially infectious materials during the performance of their job responsibilities. Although HIV and hepatitis B are mentioned most often, this program applies to all bloodborne diseases. The two main components needed to implement this program are universal precautions and engineering/work practice controls. This program covers all employees who may have occupational exposure to blood or other potentially infectious materials. Other aspects of this program are discussed. Derived from text

N94-16779 Letterman Army Inst. of Research, San Francisco, CA.
WOUND HEALING AFTER LASER INJURY TO SKIN: THE EFFECT OF OCCLUSION AND VITAMIN E Final Report
GAD A. SIMON, PETER SCHMID, WILLIAM G. REIFENRATH, THEODORE VANRAVENSWAAY, and BRUCE E. STUCK May 1993 36 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A266473) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The skin of the Yorkshire pig was irradiated with various doses of argon and copper vapor laser and evaluated for effects on healing time of pretreatment with topical or intramuscular vitamin E or the Op-Site wound dressing. Incident irradiance for both lasers was between 3.5 and 4.5 watts/cm(sup 2) for a 10-14 mm beam diameter with a near uniform intensity profile. Minimal erythemic dose for the copper vapor laser was 35 +/- 2 J/cm(sup 2) (10 second exposure) and 22.4 +/- 0.1 J/cm(sup 2) (6 second exposure) for the argon laser. Three dose levels were administered: a low dose causing light erythema, an intermediate dose, and a high dose causing dermal stasis. Exposure to argon and copper vapor lasers generally caused wounds with similar healing times. Healing time was significantly decreased for wounds caused by intermediate exposure of the copper vapor laser and either pretreated with vitamin E or treated with the wound dressing. Healing times for corresponding argon laser exposure were significantly decreased with pretreatment of intramuscular vitamin E only or after treatment with the wound dressing. These findings may be valuable in selecting treatment for accidental laser skin injuries in man. DTIC

N94-16783# Letterman Army Inst. of Research, San Francisco, CA.
THE NATURE OF DYNAMIC ARTERIOLAR VASOREACTIVITY: A MINI-REVIEW AND A CLASSIFICATION SCHEME Final Report
K. E. ARFORS, M. INTAGLIETTA, S. P. BRUTTIG, P. BORGSTROM, and J. A. SCHMIDT 8 Jun. 1993 28 p
(AD-A266499; LAIR-IR-482) Avail: CASI HC A03/MF A01

Changes in microvascular caliber are frequently observed both during normal, resting physiological conditions, as well as during physiologic stresses such as hemorrhage and fluid volume resuscitation. Many of the dynamic changes have been described with the singular term vasomotion. However, many types of frequently observed vasomotive behavior are a typical of either microvascular inactivity or vasomotion. This review describes a simple classification scheme for four types of arteriolar behavior observed routinely in our laboratory in the microvasculature of skeletal muscle of the anesthetized rabbit. These patterns include inactivity (static diameter of the open vessel which does not dynamically affect flow), vasoactivity (random, non-rhythmic changes in vessel diameter, which effect step-wise or non-rhythmic increases or decreases in flow), vasomotion (regular, rhythmic, repetitive constriction and dilation of arterioles with either a fast or slow period), and vessel closure (closure occludes flow entirely, and may divert flow to other adjoining microvascular beds). Although these patterns may not represent a functional continuum, each pattern of behavior is distinct in its effect on blood flow. Therefore, our study proposes a simple classification scheme, which will aid in understanding the dynamic response of the microvasculature to moderate or severe physiologic stress as well as the local, dynamic regulation of microcirculatory flow during pathophysiologic states. DTIC

N94-16784 Letterman Army Inst. of Research, San Francisco, CA.
RELEASE OF IRON FROM HEMOGLOBIN
S. S. PANTER 17 Feb. 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A266503) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The measurement of free iron in hemoglobin solutions as well as the measurement of total hemoglobin-bound iron are important validation assays for large-scale production of hemoglobin-based oxygen carriers. In addition, the detection of iron released from hemoglobin by oxidation or reduction reactions provides information about the stability of iron in heme. These stability measurements may be important in the characterization of structurally modified hemoglobins and can be conducted using spectrophotometric assays based on ferrozine, a chelator of ferrous iron. Techniques for the measurement of free iron in hemoglobin solutions, total hemoglobin-bound iron, and iron released from hemoglobin are described in detail. DTIC

N94-16785 Letterman Army Inst. of Research, San Francisco, CA. Div. of Blood Research.
ENCAPSULATION OF HEMOGLOBIN IN NON-PHOSPHOLIPID VESICLES
K. D. VANDEGRIFF, D. F. WALLACH, and R. M. WINSLOW 1993 6 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A266505) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The efficiency of encapsulating hemoglobin in non-phospholipid liposomes by rapidly mixing hemoglobin with lipids heated above their solid-liquid phase transition temperature was examined. Human hemoglobin was mixed at 55-60 C with a lipid solution containing polyoxyethylene-2 cetyl ether and cholesterol (molar ratio, 3:1) at 60-65 C. Repeated mixing was carried out through a high-shear orifice, followed by rapid cooling and additional mixing. Lipid vesicles were heterogeneous in size, with diameters from approximately 300 nm to 10 micrometers. The non-encapsulated aqueous phase was removed by centrifugation, and total hemoglobin was determined spectrophotometrically. Encapsulation efficiency was calculated as the percentage of hemoglobin associated with the liposome phase (i.e., encapsulated) as a function of hemoglobin concentration and the aqueous:lipid hydration ratio. Hemoglobin concentrations were varied from 1 to 10 mM (in heme). Aqueous:lipid ratios of 8:1 and 4:1 were tested. Percent encapsulation varied from 13-30%, with the greatest efficiency, i.e., 30%, at a 4:1 hydration ratio of hemoglobin:lipid at 5.6 mM hemoglobin. DTIC

N94-16786 Letterman Army Inst. of Research, San Francisco, CA. Div. of Blood Research.
NEUROTOXICITY OF HEMOGLOBIN IN CORTICAL CELL CULTURE Final Report
RAYMOND F. REGAN and S. S. PANTER 23 Sep. 1992 37 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A266506) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Hemoglobin (Hb) has been demonstrated to be neurotoxic when injected into the cerebral cortex, in vivo. However, associated

systemic factors such as ischemia and epileptogenesis have limited investigations of Hb toxicity in the intact central nervous system (CNS). In this study, the neurotoxicity of human Hb was assessed in mixed neuronal and glial neocortical cell cultures derived from fetal mice. Exposure of cultures to Hb for 24-28 hours produced widespread and concentration-dependent neuronal death (EC50 1-2.5 uM), without injuring glia. Brief exposures (1-2 hours) were not toxic. Neuronal death was completely blocked by the 21-aminosteroid U74500A, the antioxidant Trolox, and the ferric iron chelator deferoxamine. The results of these experiments suggest that, in this system, chromatographically pure Hb is a potent neurotoxin, and that Hb neurotoxicity may contribute to secondary injury processes after trauma and intracranial hemorrhage. DTIC

N94-16812# California Univ., Berkeley. Lawrence Berkeley Lab.

QUANTIFYING LIFETIME EXPOSURE TO ULTRAVIOLET RADIATION IN THE EPIDEMIOLOGY OF CUTANEOUS MALIGNANT MELANOMA: A PILOT STUDY

C. S. LEA (California Univ., Berkeley.), S. SELVIN (California Univ., Berkeley.), and P. A. BUFFLER (California Univ., Berkeley.) Oct. 1992 21 p

(Contract DE-AC03-76SF-00098)

(DE93-015274; LBL-32745) Avail: CASI HC A03/MF A01

This pilot study uses a unique method to calculate cumulative lifetime exposure to ultraviolet radiation-b (UVB) to determine if this refined method would indicate differences in lifetime cumulative UVB exposure between age and sex matched controls. Forty-four age and sex matched cases and controls demonstrated no significant difference in mean cumulative lifetime UVB exposure based on the duration and location of residence. This pilot study suggests that further analysis of the dataset should be conducted to determine if the cumulative lifetime exposure hypothesis is of primary importance regarding the association between UVB exposure and development of cutaneous malignant melanoma. DOE

N94-16970# Argonne National Lab., IL.

THE ROLE OF CONSTITUTIVE AND INDUCIBLE PROCESSES IN THE RESPONSE OF HUMAN SQUAMOUS CELL CARCINOMA CELL LINES TO IONIZING RADIATION

J. L. SCHWARTZ 1993 13 p Presented at the Molecular, Genetics and Cellular Basis of Radiosensitivity at Low Doses Workshop, Vancouver, British Columbia, 9-13 May 1993

(Contract W-31-109-ENG-38)

(DE93-015150; ANL/BIM/CP-79672; CONF-9305202-2) Avail: CASI HC A03/MF A01

The inherent radiation sensitivity of the cells within a tumor is thought to contribute to the success or failure of radiation therapy. In vitro studies have shown that radiation sensitivity differences in squamous cell carcinoma cell lines reflect alterations in DNA repair. These alterations result from constitutive changes in chromosome organization, not radiation-inducible processes. While inducible responses may play some role in the radiation response of tumor cells, there is no evidence for their involvement in inherent tumor cell radiosensitivity differences or in the success or failure of radiotherapy for squamous cell carcinomas. DOE

N94-17085*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

METHOD AND APPARATUS TO CHARACTERIZE ULTRASONICALLY REFLECTIVE CONTRAST AGENTS Patent Application

ROBERT A. PRETLOW, III, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.) 15 Nov. 1993 27 p

(NASA-CASE-LAR-14969-1; NAS 1.71:LAR-14969-1; US-PATENT-APPL-SN-153930) Avail: CASI HC A03/MF A01

A method and apparatus for characterizing the time and frequency response of an ultrasonically reflective contrast agent is disclosed. An ultrasonically reflective contrast agent is injected, under constant pressure, into a fluid flowing through a pump flow circuit. The fluid and the ultrasonically reflective contrast agent are uniformly mixed in a mixing chamber, and the uniform mixture is passed through a contrast agent chamber. The contrast agent chamber is acoustically and axially interposed between an ultrasonic transducer chamber and an acoustic isolation chamber. A pulse of ultrasonic energy is transmitted into the contrast agent chamber from the ultrasonic transducer chamber. An echo waveform is received from the ultrasonically reflective contrast agent, and it is analyzed to determine the time and frequency response of the ultrasonically reflective contrast agent. NASA

N94-17374 Naval Health Research Center, San Diego, CA.

CARPAL TUNNEL SYNDROME AND OTHER CUMULATIVE TRAUMA DISORDERS OF THE ARM AND HAND AND OCCUPATION IN US NAVY ENLISTED PERSONNEL Final Report, 1 Oct. 1991 - 30 Sep. 1992

F. C. GARLAND, C. F. GARLAND, E. J. DOYLE, JR., L. BALAZS, and R. LEVINE 15 Feb. 1993 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A267747; NHRC-93-7) Avail: CASI HC A03

The majority of reported occupational illnesses in the United States are cumulative trauma disorders of the arm and hand due to repeated motion, vibration, or pressure; among these is carpal tunnel syndrome (CTS). The objectives of this study were to describe demographic factors associated with high rates of CTS and other nerve entrapment disorders and to identify high-risk Navy occupations. Computerized records of first hospitalizations of all Navy enlisted personnel for CTS and other nerve entrapment disorders (ICD-9-CM codes 354.0-354.9) were identified during 1980 to 1988. Age-, sex-, and race-specific incidence rates and age-standardized incidence rates were calculated. There were 493 first hospitalizations for CTS in 4,095,708 person-years in men and 90 in 365,668 person-years in women. Rates of CTS rose with age in both sexes. Rates in white women were about triple those in white men, but rates in black women were not significantly different from black men. In men, occupations with significantly high standardized incidence ratios (SIRs) for CTS included aviation support equipment technician, engineman, hull maintenance technician, boatswain's mate, and machinist's mate. In women they included boatswain's mate, engineman, hospital corpsman, ocean systems technician, and personnelman. Sex and race differences do not account for the occupations at highest risk. DTIC

N94-17424 Air Force Systems Command, Brooks AFB, TX. Operations and Support Directorate.

AUTOMATED DATA COLLECTION SYSTEM FOR THE TCM3 TRANSCUTANEOUS PO2/PCO2 MONITORING SYSTEM Final Report, Jan. - Jun. 1993

ROXANNE CONSTABE Aug. 1993 18 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A268400; AL/DO-TP-1993-0025) Avail: CASI HC A03

The Hyperbaric Medicine Division of the Armstrong Laboratory (AL/AOHP) routinely uses the TCM3 Transcutaneous system for monitoring of patients and during research protocols. The monitor is used to measure the amount of oxygen/carbon dioxide at the skin surface. Up to 3 monitors may be utilized, and all data must be written down by hand at some interval. This method requires an individual to be watching the monitors at all times. If any further data analysis is to be performed, then the data must be entered into a computer by hand, or the manipulations are performed on paper. The purpose of this technical paper is to describe a data acquisition system designed to automate the collection and analysis of information processed by the TCM3 transcutaneous monitor. The hardware portion of the system is designed around a Macintosh 2 computer, and the software was written using LabVIEW 2. DTIC

N94-17456 Texas A&M Univ., College Station. Research Foundation.
MICROMECHANICS MODELING AND ANALYSIS OF HAVERSIAN COMPACT BONE TISSUES AS A FIBER REINFORCED COMPOSITE MATERIAL Annual Report, 1 Apr. 1992 - 31 Mar. 1993
HARRY A. HOGAN and RAYMOND J. DEFRESE 30 Jun. 1993 35 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0208)
(AD-A268250; AFOSR-93-0598TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This research is part of the recent AFOSR initiative in biomimetics, which has the broad overall goal of seeking to elucidate and understand the salient characteristics of naturally occurring biological composite materials with an aim toward mimicking these features in devising improved man-made composite materials. The biological composite of interest in this effort is bone tissue, or more specifically Haversian compact bone tissue. The main objective of the project is to develop a deterministic understanding of the relationships between microstructural details and macroscopic mechanical behavior. The unique fiber/matrix interphase material, which is distinctive of this type of bone tissue, is of particular interest because of the recognized significance of interfaces in developing new higher performance composites. The methodology combines composite micromechanics modeling techniques to analytically model structure/property relationships with companion experimental testing of tissue samples to evaluate and validate the modeling. DTIC

N94-17478 Texas A&M Univ., College Station. Dept. of Biology.
MELATONIN, THE PINEAL GLAND, AND CIRCADIAN RHYTHMS Annual Report, 1 Jun. 1992 - 31 May 1993
VINCENT M. CASSONE, WADE S. WARREN, DAVID S. BROOKS, and JUN LU 31 May 1993 83 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0238)
(AD-A268200; AFOSR-93-0602TR) Avail: CASI HC A05/MF A01

Amniote circadian organization derives from the interactions of the circadian oscillator and photoreceptors located in the hypothalamic suprachiasmatic nuclei (SCN), the pineal gland, and the eyes. In mammals, circadian organization is dominated by the SCN, which serve as master pacemakers in the control of a wide array of behavioral and physiological rhythms (including locomotion, sleep-wake, thermoregulation, cardiovascular function, and many endocrine processes). Among the rhythms under SCN control in mammals are the circadian synthesis and secretion of the pineal hormone melatonin, which relies on a multisynaptic pathway via the sympathetic nervous system to maintain and entrain rhythmicity in this hormone. Several studies have indicated that pineal melatonin feeds back on SCN rhythmicity to modulate circadian patterns of activity and other processes. However, the nature and system-level significance of this feedback are unknown. Recently published work indicates that although pinealectomy does not affect rat circadian rhythms in light-dark cycles or constant darkness, wheel-running activity rhythms are severely disrupted in constant light. These data suggest that either pineal feedback regulates the light sensitivity of the SCN, and/or it affects coupling among circadian oscillators within the SCN or between the SCN and its output. DTIC

N94-17554 Krug Life Sciences, Inc., San Antonio, TX.
METABOLIC MONITORING OF HYPOBARIC SUBJECTS Final Report, 16 Mar. 1990 - 16 Mar. 1991
JANET F. WIEGMAN, SEAN A. MCLEAN, ROBERT W. OLSON, and ANDREW A. PILMANIS Apr. 1993 37 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-89-C-0603)
(AD-A268221; AL-TR-1991-0057) Avail: CASI HC A03/MF A01

The objective of Task Order No. 0013, amendment to USAF Contract No. F33615-89-C0603, was to quantify the metabolic activity of subjects during isometric and isotonic exercise to develop procedures for individualized exercise performance during simulated high altitude exposures. To satisfy the stated objective, KRUG Life Sciences performed the following tasks: designed and instrumented a stack-weight machine suitable for isometric or isotonic exercise performed with the arm or legs; provided and operated an advanced metabolic measurement system capable of breath-by-breath analysis of low-level oxygen consumption data; provided for administration of criterion tests for maximal oxygen consumption (VO2 max) and maximal voluntary contraction; developed procedures for equating and individualizing the isometric and isotonic work by means of oxygen consumption (% of VO2 max); and provided procedures for training subjects on the individual exercise programs. DTIC

N94-17556# Naval Medical Research Inst., Bethesda, MD.
HUMAN CENTRAL NERVOUS SYSTEM OXYGEN TOXICITY DATA FROM 1945 TO 1986 Technical Report, 1986 - 1992
ANDREA L. HARABIN Jan. 1993 142 p
(AD-A268225; NMRI-93-03) Avail: CASI HC A07/MF A02

This report contains a summary of all known results from controlled human exposures to hyperbaric O2. The data were collected for analysis and development of predictive models relating the risk of developing a symptom of central nervous system O2 toxicity as a function of time, depth, and condition of exposure. Data were obtained from publications and technical reports and verified by original records and log books. A total of 2,170 exposures, at depths ranging from 12 feet of sea water (fsw) to 100 fsw for up to 240 min, are included. The data consist of exposure time, depth, fraction of inspired O2, temperature, whether or not subjects exercised, whether they were immersed in water or exposed in a dry chamber, and outcome of the exposure, i.e., whether a symptom developed or the exposure was completed safely. Studies conducted under the following conditions were found: dry, no exercise; dry, exercise; immersed, no exercise; and immersed, exercise. The final category was divided into old (before 1972) and new. DTIC

N94-17562# Naval Medical Research Inst., Bethesda, MD.
METHODS TO OBTAIN BLOOD SAMPLES PERIODICALLY DURING EXERCISE RESEARCH STUDIES WHILE SUBJECTS ARE IMMERSED IN WATER OR OTHERWISE INACCESSIBLE Technical Report, 1990 - 1992
J. W. THORP, J. R. ROBERTS, and T. J. DOUBT Jan. 1993 14 p
(AD-A268227; NMRI-93-02) Avail: CASI HC A03/MF A01

We describe a method to obtain periodic blood samples during exercise studies by use of an indwelling intravenous catheter. A step-by-step process for establishing the intravenous line and obtaining samples is also described. Steps we have found especially useful to facilitate the process and to avoid complications are presented in more detail. A list of supplies required for the process is included. With these methods, we have been able to obtain samples from subjects performing heavy exercise on cycle ergometers and from other subjects who were immersed for up to three hours in water at 18 deg C and working on an underwater ergometer. Hemorrhage, infection, or other complications did not occur. The only failure has been occasional inability to obtain a blood sample because blood flow was inadequate. DTIC

N94-17621# Utah Univ., Salt Lake City. Dept. of Electrical Engineering.
CURRENTS INDUCED IN THE HUMAN BODY FOR EXPOSURE TO ULTRAWIDEBAND ELECTROMAGNETIC PULSES Final Report, Aug. - Nov. 1992
OM P. GANDHI and CYNTHIA M. FURSE May 1993 32 p
(Contract F33615-91-C-0600)
(AD-A268570; AL-TR-1992-0156) Avail: CASI HC A03/MF A01

We have used the recently developed frequency-dependent finite-difference time-domain ((FD)(sup 2)TD) method to calculate internal electric fields and induced current densities in a 1.31-cm resolution anatomically based model of the human body for

exposure to an ultrawideband vertically polarized electromagnetic pulse (EMP). The Fourier spectrum of the pulse revealed that it had energy content to about 1500 MHz with the bulk of the energy being in the frequency band 400-800 MHz. The complex permittivities epsilon*(w) for the various tissues are known to vary a great deal over the wide bandwidth of the incident pulse. In the ((FD)(sup 2)TD) formulation, these frequency-dependent epsilon*(w) have been described by the best-fit two-relaxation Debye equations with different constants epsilon(sub infinity), epsilon(sub s1), and epsilon(sub s2) for the sixteen tissues (fat, muscle, blood, etc.) that are used in defining the anatomically based model. From the values of the induced electric displacement vector D, we have calculated the time variations of the vertical currents that pass through each of the sections of the model that is assumed to be either isolated or shoe-wearing, standing above a perfectly conducting ground plane. Peak vertical currents with magnitudes on the order of 1-4 mA per V/m of incident electric fields are calculated with the highest values calculated for the sections through the bladder and slightly above it. DTIC

N94-17699# Oak Ridge National Lab., TN.
NUCLEAR MEDICINE PROGRAM Quarterly Progress Report, period ending 31 Mar. 1993
F. F. KNAPP, JR., K. R. AMBROSE, A. L. BEETS, A. P. CALLAHAN, D. W. MCPHERSON, S. MIRZADEH, and C. R. LAMBERT Apr. 1993 13 p
(Contract DE-AC05-84OR-21400)
(DE93-013896; ORNL/TM-12343) Avail: CASI HC A03/MF A01

We have explored the possibility of measuring urinary radioactivity as an index of pancreatic lipase activity after oral administration of a new triglyceride containing a radioactive iodine-125-labeled fatty acid moiety. The new agent, 1,2-dipalmitoyl- 3(15-(p-iodophenyl) pentandecan-1-oyl)- racglycerol (1,2-Pal-3-IPPA), was prepared by the thallation-iodide displacement method. Following oral gavage of the radioiodinated triglyceride to rats, about 30% of the administered activity was excreted in 24 hours in the urine. In normal human controls a higher urinary excretion (of about 75%) was observed. In this report, we describe an evaluation of the metabolites excreted in the urine and the chemical species stored in adipose from rats. The urine activity co-chromatographed with hippuric acid by TLC indicating conjugation of the IPPA metabolites. Release of the acidic components from the conjugated excretory products by acid hydrolysis of the urine provided the radioactive acidic IPPA metabolites. Analysis of the Folch extracts of fat samples from rats demonstrated that the radioactive components co-chromatographed in the triglyceride region. Recent studies in patients with compromised pancreatic exocrine function have demonstrated significantly decreased 24 hr. urinary excretion of about 25%, following oral administration of (1-131)- 1,2-Pal-3-IPPA. Thus, urine analysis after oral administration of (1-131)-1,2-Pal-3-IPPA may be a simple, non-invasive tool for the clinical evaluation of various diseases involving dietary fat digestion.
DOE

N94-17823# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Inst. of Environmental Medicine.
EFFECTS OF A HIGH-ENERGY FOOD SUPPLEMENT ON COLD-INDUCED THERMOGENESIS
A. L. VALLERAND and I. JACOBS Aug. 1993 29 p
(AD-A269301; DCIEM-93-36) Avail: CASI HC A03/MF A01

In previous studies, we have not been able to confirm the theory that energy substrate mobilization is a limiting factor for cold-induced thermogenesis (M) in humans. One possible explanation for the conflicting results is that the dose of energy substrates may not have been optimal. The goal of this study was to determine whether the ingestion of a high-energy food supplement (710 kcal or 2,970 kJ; Ensure Pulse) in the cold could alter: (1) M, (2) heat balance (min by min determination of heat debt (S) where S = M - heat losses, (3) rectal (T sub re) and (4) mean skin temperatures (T sub sk), (5) rates of substrate oxidation, and (6) plasma levels of substrates and hormones, taken as indices of substrate mobilization. Seven healthy males were subjected to two semi-nude cold exposure tests (3h at 7 C, 1 m/.s wind, fasting, tests performed 1 wk apart). The ingestion of a high-energy supplement did not influence either T sub re, T sub sk, m, or S in comparison to the placebo test in the same subjects. This absence of changes was observed even though the supplement elevated carbohydrate mobilization and oxidation (P less than 0.05), albeit at the expense of lipid mobilization and oxidation (P less than 0.05). The present results demonstrate that the ingestion of a food supplement that enhances energy substrate mobilization and oxidation does not alter cold thermogenesis, heat debt or body temperatures in humans, under normal conditions. DTIC

N94-17824# Army Aeromedical Research Lab., Fort Rucker, AL.
USING CONTROLLED DAYLIGHT EXPOSURE AND SLEEP TIMING IN THE PREVENTION OF SHIFT LAG DURING NIGHT OPERATIONS Technical Report
CARLOS A. COMPERATORE Jun. 1993 37 p
(AD-A269304; USAARL-93-25) Avail: CASI HC A03/MF A01

In the Army aviation community, a significant component of combat and training missions is night operations. Mission requirements often necessitate an initial shift from daytime to nighttime duty hours within 24 to 48 hours. Rapid shifts from daytime to nighttime work, and nighttime to daytime sleep usually result in loss of sleep, degradation of alertness, increased fatigue, and reduced work effectiveness. These symptoms are referred to as 'shift-lag' because the body's physiological adjustment lags behind the rapid shift to the new work schedule. Research on shiftwork provides a variety of approaches to avoid the deterioration of performance and health of shiftworkers. Shift-lag prevention plans may consider the speed of shiftwork rotation, the duration of each shift, age of workers, physical strength associated with work demands, diet, timing of sleep, and in some cases, the use of drugs to induce sleep and attempt to resynchronize the body's internal biological clock. However, the use of controlled timing of daylight exposure and of sleep schedules are of overriding importance. In the Army aviation context, consequences of shifts to nocturnal work schedules without the implementation of a shift-lag prevention plan have been recently documented. This work reviews the mechanism of biological timing in humans, the role of environmental lighting, and specifically identifies methods of preventing sleep loss and fatigue during the transition from daytime to nighttime duty hours. DTIC

N94-17966 Institute for Perception RVO-TNO, Soesterberg (Netherlands). Work Environment Group.
SYNCHRONISATION OF COLD INDUCED VASODILATION AT VARIOUS LOCATIONS OF ONE HAND Final Report
H. A. M. DAANEN and W. A. LOTENS 6 Jul. 1992 22 p
Sponsored by TNO Defence Research, Delft, Netherlands
(IZF-1992-B3; TD92-0258; ETN-93-94526) Copyright Avail: TNO Institute for Perception, Kampweg 5, 3769 ZG Soesterberg, Netherlands

The amount of correspondence between the Cold Induced Vasodilation (CIVD) responses in several sites of the left hand is quantified by the Pearson Correlation Coefficient (PCC) of the local skin temperatures. A PCC of zero means that all registrations are independent, indicating a purely local mechanism. A PCC approaching 1 indicates an increasing central component. Twelve subjects immersed their left hands in a calorimeter water bath of 5 C. All PCC's of the fingers and the ventral and dorsal side of the hand were calculated. A period of 30 minutes was analyzed, starting 10 minutes after immersion. The PCC was higher for neighboring fingers (PCC = 0.67) than for fingers separated by other fingers (PCC = 0.48). For neighboring fingers those mainly innervated by the same somatic nerve (ring-little and index-middle finger) had a higher PCC (PCC = 0.80) than for the fingers with more separate innervation (PCC = 0.55). The PCC between the two locations on the hands and the fingers were insignificant. It is concluded that the CIVD of the fingers shows so much correspondence that a central component is clearly presented. From the difference in PCC between neighboring and other fingers it can be seen that local mechanisms also determine the CIVD

characteristics. Theories based on nervous involvement are supported by the finding that shared somatic innervation enhances the PCC. ESA

N94-18080 Technische Univ., Delft (Netherlands).
CONTROL OF SHOULDER MUSCLES DURING GOAL DIRECTED MOVEMENTS
R. HAPPEE 1992 190 p
(PB93-195139; ISBN-90-370-0077-0) Copyright Avail: CASI HC A09/MF A02

The control of shoulder muscles during goal directed movements has been studied experimentally and by simulations. Muscular activity was assessed experimentally by measuring electromyographic (EMG) activity. In the EMG of maximally fast movements, triphasic activity comparable to activity reported in other joints was found. The agonist activity in the first phase causes acceleration of the limb. The antagonist activity in the second phase serves to decelerate the limb. In a simulation study it was shown that the third phase contributes to a time optimal movement. The role of the third phase is shown to be related to muscle dynamics. A model has been developed which gives an accurate description of movement kinematics and which is based on interpretable parameters. Four parameters describe the timing of a triphasic muscular input and a fifth parameter describes neuromuscular dynamics. The parameters provide a means to compare the shape of movement traces under different experimental conditions. After scaling towards the movement velocity, these parameters revealed a significant dependence on the movement direction and the maximum velocity obtained by the subjects. NTIS

N94-18190 California Univ., Berkeley. School of Optometry.
FY 1991 AASERT: SPATIO-TEMPORAL MAKING IN HUMAN VISION AND ITS APPLICATION TO IMAGE CODING Annual Report, 15 Jun. 1992 - 14 Jun. 1993
STANLEY A. KLEIN Jul. 1993 4 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0359)
(AD-A268795; AFOSR-93-0635TR) Avail: CASI HC A01

We measured the temporal dynamics of relative motion judgement. Two lines or dots oscillated either in the same phase of motion, or in 180 phase relative to each other. Subjects were required to discriminate between the two kinds of motion. The dots either oscillated vertically or horizontally. The former case produced oscillating orientation and the later case produced oscillating separation. The temporal frequency of oscillation was varied (presented at OSA-1992). In experiments with lines, the separation of the lines was varied while the distance of the lines from the fovea was held constant. The discriminability of two different phases of relative motion was measured and compared to the detectability of these motions. The physchometric transducer functions were measured and plotted. DTIC

N94-18226 Naval Biodynamics Lab., New Orleans, LA.
BIBLIOGRAPHY OF SCIENTIFIC PUBLICATIONS OF THE NAVAL BIODYNAMICS LABORATORY, 1980 - 1992
Jul. 1993 33 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A268886; NBDL-93R001) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report lists all research reports, special reports, monographs, technical memoranda, joint reports, research information bulletin, journal articles, and conference proceedings published by the Naval Biodynamics Laboratory between Jan. 1980 and Dec. 1992 DTIC

N94-18289# Army Aeromedical Research Lab., Fort Rucker, AL.
US ARMY AVIATION EPIDEMIOLOGY DATA REGISTER: PREVALENCE OF REFRACTIVE ERROR AMONG US AIRCREW MEMBERS Final Report
KEVIN T. MASON, S. C. SHANNON, and ROBERT H. SCHRIMSHER Jun. 1993 30 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A269550; USAARL-93-24) Avail: CASI HC A03/MF A01

The U.S. Army aviation branch is making final funding and planning decisions on the fielding of a contact lens program for Army aircrew members. This report stratifies the prevalence of refractive error by aviation duty position, service component, and rank. There is an increasing prevalence of refractive error in the higher ranking aircrew members, paralleling increasing age with rank promotion. Comparing service components, the prevalence is higher in the reserve component and civilian forces than active duty forces. Within the aviator service component cohorts, there has been a significant upward trend in the annual period prevalence of refractive error from 1986 through 1992, especially in the Army Reserve and National Guard cohorts. This upward trend may be related to the observed upward trend in the average age of Army aircrew members as a group from 1986 through 1990. DTIC

N94-18294# Food and Drug Administration, Rockville, MD. Center for Devices and Radiological Health.
A STUDY OF THE EFFECTS OF HIGH POWER PULSED 2450 MHZ MICROWAVES, ELF MODULATED MICROWAVES, AND ELF FIELDS ON HUMAN LYMPHOCYTES AND SELECTED CELL LINES Final Report, 1 Sep. 1991 - 31 Dec. 1992
MAYS L. SWICORD 27 Jan. 1993 98 p
(AD-A269070) Avail: CASI HC A05/MF A02

The Center for Devices and Radiological Health of the Food and Drug Administration has performed research over the past two years with financial support from the Walter Reed Army Institute of Research. This research has addressed three tasks which are described in the report. DTIC

N94-18392 Geo-Centers, Inc., Frederick, MD.
REVIEW OF SHORT-TERM, HIGH-LEVEL EXPOSURE TO METALS: ANTIMONY, BARIUM, AND CADMIUM Technical Report, Sep. 1992 - Jun. 1993
JAMES C. EATON 16 Jun. 1993 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAMD17-93-C-3006; DA PROJ. 3M1-62787-A-878)
(AD-A268896; USABRDL-TR-9303) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The adverse health effects of inhaling the metals antimony, barium, and cadmium which are components of exhaust from military weapons systems have been reviewed. The metals antimony and cadmium are suspected carcinogens. In addition, cadmium at chronic low level has been implicated in kidney dysfunction. There are no documented exposures of Army personnel to the high levels that would result in severe acute effects. Since the chronic effects of these three metals are cumulative, the 8-hour time-weighted average exposure is the proper mechanism for regulating episodic short-term exposures to them at moderately high levels. The report recommends that the Army adhere to the established Federal workplace exposure limits for the three metals and that exposure to antimony and cadmium, the two metals with demonstrated carcinogenic activity, be reduced to a level as low as is reasonably achievable. DTIC

N94-18407 California Univ., Irvine. Center for the Neurobiology of Learning and Memory.
THE IDENTIFICATION OF THE COMPUTATIONAL SIGNIFICANCE OF KEY NEUROBIOLOGICAL CHARACTERISTICS FOUND IN A NUMBER OF TELENCEPHALIC BRAIN REGIONS Final Technical Report
GARY LYNCH and RICHARD GRANGER 1993 7 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-J-3179)
(AD-A269374) Avail: CASI HC A02

The funded research has had as its primary goal the identification of the computational significance of key neurobiological characteristics found in a number of telencephalic brain regions. Recent findings have identified novel, computationally

valuable algorithms derived from simulation and analysis of specific brain networks, including the olfactory system and the hippocampus as well as auditory neocortex. Analysis has shown that, as might be expected from networks faced with demanding signal-processing tasks under limited-resource situations, these brain-based algorithms have very efficient time and space complexity characteristics and are directly applicable to signal processing tasks of known difficulty, including processing of complex time-varying signals such as speech and sonar. DTIC

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A94-10503* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ASSESSMENTS OF ASTRONAUT EFFECTIVENESS
ROBERT M. ROSE (John D. and Catherine T. MacArthur Foundation, Chicago, IL), ROBERT L. HELMREICH (NASA; Univ. of Texas; FAA, Austin), LOUIS FOGG (Rush Univ., Chicago, IL), and TERRY J. MCFADDEN (NASA; Univ. of Texas; FAA, Austin) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 789-794. refs
(Contract NAS9-18440)
Copyright

This study examined the reliability and convergent validity of three methods of peer and supervisory ratings of the effectiveness of individual NASA astronauts and their relationships with flight assignments. These two techniques were found to be reliable and relatively convergent. Seniority and a peer-rated Performance and Competence factor proved to be most closely associated with flight assignments, while supervisor ratings and a peer-rated Group Living and Personality factor were found to be unrelated. Results have implications for the selection and training of astronauts.

A94-10504
COMMUNICATION BETWEEN SPACE CREWS AND GROUND PERSONNEL - A SURVEY OF ASTRONAUTS AND COSMONAUTS
ALAN D. KELLY (Applied Communications Corp., Burlingame, CA) and NICK KANAS (USVA, Medical Center; California Univ., San Francisco) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 795-800. refs
Copyright

A total of 54 astronauts and cosmonauts returned questionnaires which addressed several aspects of communication between space crews and ground personnel. Two factors were rated as significantly helping this communication: shared experience and excitement of space flight. Two additional factors were judged to significantly hinder space-ground communication: spacecraft ambient noise and space sickness. Respondents also significantly endorsed the value of contact with loved ones on earth as having a positive influence on mission performance, particularly cosmonauts and long-duration space travelers. The need for a private space-ground transmission link was mentioned by several respondents. There was no consensus as to whether or not negative personal information should be withheld until the space crew returned to earth, although some respondents indicated that this might be justified during short-duration as opposed to long-duration missions. These findings have important scientific and operational implications for future manned space missions.
Author (revised)

A94-11147* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A COMPLEX REACTION TIME STUDY (STERNBERG) IN SPACE FLIGHT
W. THORNTON, JOHN URI (NASA, Johnson Space Center, Houston, TX), and TOM MOORE (Minnesota Univ., Minneapolis) Oct. 1993 5 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-149)

Simple and complex (Sternberg) reaction time studies were flown on three and seven day Shuttle flights in 1985. Three subjects did selftesting with an onboard handheld calculator without difficulty. There was little change in simple reaction time. One subject demonstrated a decrease in the processing rate during space motion sickness while a second exhibited an increase in complex reaction time without a change in processing rate during a period of high work load. The population was too small to demonstrate significant changes. This study demonstrates the ease and practicality of such measurements and indicates the potential value of such studies in space.

A94-11148
EXEMSI'92 - 60 DAYS ISOLATION AND CONFINEMENT PREPARING LONG DURATION MANNED SPACEFLIGHTS
A. F. BICHI (ESA, Paris, France) and J. D. SCHIEMANN (ESTEC, Noordwijk, Netherlands) Oct. 1993 11 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993
(IAF PAPER 93-150) Copyright

The paper describes the EXEMSI'92 experiment of 60-day-long isolation and confinement, performed for assessing the effect of a long duration manned spaceflight on human requirements and behavior under such conditions. The experiment involved one female and three male subjects, selected according to the crew selection process based on the astronaut selection criteria, subjected to the training program derived from astronaut training, and required to adhere to a multidisciplinary experimental work program representative of a space mission. The organization, performance, and preliminary results of the EXEMSI'92 campaign are presented. AIAA

A94-11149
RESOURCE MANAGEMENT TRAINING - CURRENT RESULTS AND EVOLVING UNITED STATES AIR FORCE/NASA PLANS
E. A. THOMPSON (Hernandez Engineering, Inc., Houston, TX) Oct. 1993 8 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-152) Copyright

Results of cockpit/crew resource management (CRM) and resource management (RM) training programs are reviewed. Particular attention is given to the prior application of mission specific CRM training programs, evolving training concepts for military and commercial aviation, the program's effectiveness, NASA's interest in this training for space mission applications, and recent program results. It is concluded that the emphasis of current RM training programs is placed on mission effectiveness which has no reporting system to measure an impact due to the institutionalization of human factor principles. Existing pre- and post-training questionnaires must be augmented by more useful measurement instruments. AIAA

A94-11150
A PLURIDISCIPLINARY APPROACH FOR HUMAN COMMUNICATION IN FUTURE SPACE MISSIONS
B. PAVARD (CNRS, Toulouse, France), L. ROGNIN (Matra Marconi Space, Toulouse, France), V. NOSULENKO (Research Center on Computer Communication, Moscow, Russia), L. BRAAK (Inst. of Medicine and Spatial Physiology, Toulouse, France), and J. P. DENIER (Matra Marconi Space, Toulouse, France) Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by Ministere de la Recherche et de l'Espace of France, Maison des Sciences de l'Homme of France, and Research Center on Computer Communication of Russia refs
(IAF PAPER 93-153) Copyright

Pluridisciplinary and cross-cultural research on the human reliability in complex systems conducted in the framework of a French/Russian project is discussed. The approach is aimed at

designing a new work organization in control centers implying adapted responsibility share, human protocols, procedures, and information handling for future manned space missions. The research uses the experience of the organization and communications inside a Russian space mission control center to obtain better understanding of the control of communications between the spacecraft and the ground, or within the spacecraft.
AIAA

A94-11152
NATIONAL AEROSPACE PLANE (NASP) ACCELERATION PROFILES - EFFECTS OF LOW-LEVEL +GZ ON REACTION TIME, KEYPAD ENTRY, AND REACH ERROR
KATHY MCCLOSKEY and WILLIAM B. ALBERY (USAF, Armstrong Lab., Wright-Patterson AFB, OH) Oct. 1993 11 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-156)

The NASP is projected to have a flight mission which could generate a maximum of 4-2.5 gz for up to 30 minutes. Very little is known about the effects of this type of acceleration profile on human performance. Thus, 8 subjects were exposed to +2 gz for 40 minutes on the Dynamic Environment Simulator centrifuge, during which time they performed a choice reaction time task, a keypad entry task, and a reach task. The tasks were based on one of many preliminary NASP cockpit designs. Results indicated that for simple reaction time tasks no performance decrements were found; in fact, a slight increase in performance occurred. For the keypad task, however, performance decrements were found throughout the entire profile. The reach task showed decrements early in the exposure, but towards the end performance reached 1g baseline levels. This suggests a 'recalibration' of gross motor movement during long exposure to low-level acceleration. Results indicated that input devices which require large arm/hand movements should be mounted no farther than 53.9 cm from the floor and 89.7 cm away from the intersection of the seat back/pan of an ACES II-type seat. Keypad entry devices should have button sizes of at least 1.9 cm by 1.9 cm, and should be mounted on a swivel device to reduce uncomfortable wrist angles.
Author (revised)

A94-11153
FUNCTIONAL ABILITY OF THE OPERATORS AFTER WEIGHTLESSNESS
V. V. LAPA and V. A. PONOMARENKO (Inst. for Biomedical Problems, Moscow, Russia) Oct. 1993 5 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-157) Copyright

The features of operator's sensorimotor activity and their effect on the control of a dynamic object after short-lived exposure of weightlessness are discussed. Two series of experiments were conducted: one on the flight simulator (after exposure to 7 days of simulated hypogravity) and another in flight on board of aircraft-laboratory (after a 7 day space flight). In both series of the experiments, there were revealed similar changes in processes of perception and sensorimotor coordination (augmentation of control stick expenditure, its discordance with the bioelectric activity of muscles involved in movements, a shift of their spectral power toward higher frequencies); these may be seen as a partial deautomation of flying skill. The last circumstance has been considered as a potential unreliability risk factor of cosmonaut's control actions, in case of probable complications of activity conditions or augmentation of requirements for the precision of control tasks.
Author (revised)

A94-11362
TRAINING FOR ACCIDENTS OR TRAINING FOR SAFETY
T. CARVER (Civil Aviation Authority, London, United Kingdom) *In* The use of simulation in aircraft accident prevention and investigation; Proceedings of the Conference, London, United Kingdom, Nov. 11, 12, 1992 London Royal Aeronautical Society 1992 p. 7.1-7.7.
Copyright

Flight simulator-based accident training is at its best when derived from a balanced diagnosis of known incidents and accidents, as well as the reactions of the student crews during initial and recurrent training and testing. It is also ideal if the training method designer judiciously apportions exposure to the simulated material over time.
AIAA

A94-11709
REPEATED MEASURES OF MENTAL PERFORMANCES ON TRANSOCEANIC FLIGHT CREWS
RICHARD A. CORNELL (Central Florida Univ., Orlando, FL), ROBERT S. KENNEDY, and MARTIN G. SMITH (Essex Corp., Orlando, FL) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 9-18. Research supported by Charles A. Lindbergh Fund refs
(SAE PAPER 921906) Copyright

The effect of short periods of resistance exercise on the cognitive performance of airline cockpit crews flying transoceanic routes was tested. The tests, run using laptop computers, involved choice reaction time, pattern comparison, code substitution, two-handed tapping, preferred hand tapping, and nonpreferred hand tapping. The results indicate that exercise has a positive impact on pilot performance.
AIAA

A94-11710
REAL WORLD EXPERIENCE IN FITNESS-FOR-DUTY TESTING
R. W. ALLEN (Systems Technology, Inc., Hawthorne, CA), MARK SILVERMAN, and MARK ITKONEN *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 19-26. refs
(SAE PAPER 921908) Copyright

This paper considers experience gained from conducting fitness-for-duty testing in the work place, and reviews results obtained with a specific psychomotor task. Performance testing can provide a means for messing worker fitness-for-duty prior to their admittance to safety critical job functions, but the testing must be reliable and efficient. This paper will discuss the balance between efficacy and efficiency and provide example data from a test that is currently employed in the work place.

N94-10251# Japan Atomic Energy Research Inst., Tokyo.
FUNCTIONAL REASONING, EXPLANATION, AND ANALYSIS
B. H. FAR (Japan Atomic Energy Research Inst., Tokai.) Jan. 1992 104 p
(DE92-526832; JAERI-M-91-225) Avail: CASI HC A06/MF A02

Functional Reasoning (FR) enables people to derive the purpose of objects and explain their functions. JAERI's 'Human Acts Simulation Program (HASP)', started from 1987, has the goal of developing programs of the underlying technologies for intelligent robots by imitating the intelligent behavior of humans. FR is considered a useful reasoning method in HASP and applied to understand function of tools and objects in the Toolbox Project. First, the results of the diverse FR researches within a variety of disciplines are reviewed and the common core and basic problems are identified. Then the qualitative function formation (QFF) technique is introduced. Some points are: extending the common qualitative models to include interactions and timing of events by defining temporal and dependency constraints, and binding it with the conventional qualitative simulation. Function concepts are defined as interpretations of either a persistence or an order in the sequence of states, using the trace of the qualitative state vector derived by qualitative simulation on the extended qualitative model. This offers solutions to some of the FR problems and leads to a method for generalization and comparison of functions of different objects.
DOE

N94-10731# National Aerospace Lab., Tokyo (Japan). Computational Sciences Div.
SUBROUTINE FUNCTIONS FOR GENERATING ANIMATION DATA [ANIMESHON YOU GAZOU DETA SEISEI SABURUCHIN KINOU NITSUITE]
KAZUYO SUEMATSU Apr. 1992 37 p In JAPANESE Original contains color illustrations
(ISSN 0389-4010)
(DE93-767973; NAL-TR-1147; JTN-93-80430) Avail: CASI HC A03/MF A01

Several subroutine functions are reported which enable data generated by computer numerical simulations to be more efficiently animated and visualized. Included are functions to transform graphic data, a function to display overlapped surfaces, functions which create images little by little, and functions which add annotations. Author (NASDA)

N94-10909 North Carolina Univ., Chapel Hill. Dept. of Psychology.
VISUAL ENCODING OF SPATIAL RELATIONS Annual Report
CHRISTINA A. BURBECK 26 May 1993 40 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0114)
(AD-A266049; AFOSR-93-0420TR) Avail: CASI HC A03

Psychophysical studies of the processes underlying spatial localization and their relationship to both lower and higher level processing were conducted. The spatial extent of position integration areas was measured and found to be adequate to account for the increase in separation discrimination thresholds with separation. The influence of the spatial frequency of embedded targets was investigated and found to be insignificant, as it had previously been found to be for isolated targets. The relationship between separation discrimination and object formation was investigated and a model of the process of object formation developed. Studies on how area is encoded were conducted and related to the model of object formation. DTIC

N94-11098# Naval Aerospace Medical Research Lab., Pensacola, FL.
LANDING CRAFT AIR CUSHION (LCAC) CREW SELECTION SYSTEM MANUAL Final Report, 1988 - 1992
KATHLEEN T. HELTON, TATREE NONTASAK, and DANIEL L. DOLGIN Dec. 1992 73 p
(AD-A265158; NAMRL-SR-92-4) Avail: CASI HC A04/MF A01

The Naval Aerospace Medical Research Laboratory developed and validated a crew selection test battery for the Landing Craft Air Cushion (LCAC) vehicle. This battery, now called the Landing Craft Air Cushion Crew Selection System (LCSS), has been operationally implemented. This user's manual provides system information, test administration, and data management procedures. In addition, information on the development of the LCSS, its hardware configuration, and software components are included. DTIC

N94-11511*# Virginia Univ., Charlottesville. Dept. of Psychology.
PERCEPTUAL RESPONSE TO VISUAL NOISE AND DISPLAY MEDIA Final Report, 1 Jul. 1992 - 30 Jun. 1993
FRANK H. DURGIN and DENNIS R. PROFFITT 30 Jun. 1993 15 p
(Contract NAG2-814)
(NASA-CR-193406; NAS 1.26:193406) Avail: CASI HC A03/MF A01

The present project was designed to follow up an earlier investigation in which perceptual adaptation in response to the use of Night Vision Goggles, or image intensification (I squared) systems, such as those employed in the military were studied. Our chief concern in the earlier studies was with the dynamic visual noise that is a byproduct of the I(sup 2) technology: under low light conditions, there is a great deal of 'snow' or sporadic 'twinkling' of pixels in the I(sup 2) display which is more salient as the ambient light levels are lower. Because prolonged exposure to static visual noise produces strong adaptation responses, we reasoned that the dynamic visual noise of I(sup 2) displays might have a similar effect, which could have implications for their long term use. However, in the series of experiments reported last year, no evidence at all of such aftereffects following extended exposure to I(sup 2) displays were found. This finding surprised us, and led us to propose the following studies: (1) an investigation of dynamic visual noise and its capacity to produce after effects; and (2) an investigation of the perceptual consequences of characteristics of the display media. Author (revised)

N94-11530*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TRANSFER OF TRAINING FOR AEROSPACE OPERATIONS: HOW TO MEASURE, VALIDATE, AND IMPROVE IT
MALCOLM M. COHEN *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 482-487 Feb. 1993
Avail: CASI HC A02/MF A03

It has been a commonly accepted practice to train pilots and astronauts in expensive, extremely sophisticated, high fidelity simulators, with as much of the real-world feel and response as possible. High fidelity and high validity have often been assumed to be inextricably interwoven, although this assumption may not be warranted. The Project Mercury rate-damping task on the Naval Air Warfare Center's Human Centrifuge Dynamic Flight Simulator, the shuttle landing task on the NASA-ARC Vertical Motion Simulator, and the almost complete acceptance by the airline industry of full-up Boeing 767 flight simulators, are just a few examples of this approach. For obvious reasons, the classical models of transfer of training have never been adequately evaluated in aerospace operations, and there have been few, if any, scientifically valid replacements for the classical models. This paper reviews some of the earlier work involving transfer of training in aerospace operations, and discusses some of the methods by which appropriate criteria for assessing the validity of training may be established. Author (revised)

N94-11531*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SIGNAL DETECTION THEORY AND METHODS FOR EVALUATING HUMAN PERFORMANCE IN DECISION TASKS
KEVIN OBRIEN (Lockheed Engineering and Sciences Co., Houston, TX.) and EVAN M. FELDMAN (Rice Univ., Houston, TX.) *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 489-496 Feb. 1993
Avail: CASI HC A02/MF A03

Signal Detection Theory (SDT) can be used to assess decision making performance in tasks that are not commonly thought of as perceptual. SDT takes into account both the sensitivity and biases in responding when explaining the detection of external events. In the standard SDT tasks, stimuli are selected in order to reveal the sensory capabilities of the observer. SDT can also be used to describe performance when decisions must be made as to the classification of easily and reliably sensed stimuli. Numbers are stimuli that are minimally affected by sensory processing and can belong to meaningful categories that overlap. Multiple studies have shown that the task of categorizing numbers from overlapping normal distributions produces performance predictable by SDT. These findings are particularly interesting in view of the similarity between the task of the categorizing numbers and that of determining the status of a mechanical system based on numerical values that represent sensor readings. Examples of the use of SDT to evaluate performance in decision tasks are reviewed. The methods and assumptions of SDT are shown to be effective in the measurement, evaluation, and prediction of human performance in such tasks. Author

N94-11532*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CRITERIA FOR ASSESSING PROBLEM SOLVING AND DECISION MAKING IN COMPLEX ENVIRONMENTS Abstract Only

JUDITH ORASANU *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 497 Feb. 1993
Avail: CASI HC A01/MF A03

Training crews to cope with unanticipated problems in high-risk, high-stress environments requires models of effective problem solving and decision making. Existing decision theories use the criteria of logical consistency and mathematical optimality to evaluate decision quality. While these approaches are useful under some circumstances, the assumptions underlying these models frequently are not met in dynamic time-pressured operational environments. Also, applying formal decision models is both labor and time intensive, a luxury often lacking in operational environments. Alternate approaches and criteria are needed. Given that operational problem solving and decision making are embedded in ongoing tasks, evaluation criteria must address the relation between those activities and satisfaction of broader task goals. Effectiveness and efficiency become relevant for judging reasoning performance in operational environments. New questions must be addressed: What is the relation between the quality of decisions and overall performance by crews engaged in critical high risk tasks? Are different strategies most effective for different types of decisions? How can various decision types be characterized? A preliminary model of decision types found in air transport environments will be described along with a preliminary performance model based on an analysis of 30 flight crews. The performance analysis examined behaviors that distinguish more and less effective crews (based on performance errors). Implications for training and system design will be discussed.
Author (revised)

N94-11533*# Krug Life Sciences, Inc., San Antonio, TX.
MONITORING COGNITIVE FUNCTION AND NEED WITH THE AUTOMATED NEUROPSYCHOLOGICAL ASSESSMENT METRICS IN DECOMPRESSION SICKNESS (DCS) RESEARCH
Abstract Only
THOMAS E. NESTHUS and SAMMUEL G. SCHIFLETT (Aerospace Medical Research Labs., Brooks AFB, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 498 Feb. 1993
Avail: CASI HC A01/MF A03

Hypobaric decompression sickness (DCS) research presents the medical monitor with the difficult task of assessing the onset and progression of DCS largely on the basis of subjective symptoms. Even with the introduction of precordial Doppler ultrasound techniques for the detection of venous gas emboli (VGE), correct prediction of DCS can be made only about 65 percent of the time according to data from the Armstrong Laboratory's (AL's) hypobaric DCS database. An AL research protocol concerned with exercise and its effects on denitrogenation efficiency includes implementation of a performance assessment test battery to evaluate cognitive functioning during a 4-h simulated 30,000 ft (9144 m) exposure. Information gained from such a test battery may assist the medical monitor in identifying early signs of DCS and subtle neurologic dysfunction related to cases of asymptomatic, but advanced, DCS. This presentation concerns the selection and integration of a test battery and the timely graphic display of subject test results for the principal investigator and medical monitor. A subset of the Automated Neuropsychological Assessment Metrics (ANAM) developed through the Office of Military Performance Assessment Technology (OMPAT) was selected. The ANAM software provides a library of simple tests designed for precise measurement of processing efficiency in a variety of cognitive domains. For our application and time constraints, two tests requiring high levels of cognitive processing and memory were chosen along with one test requiring fine psychomotor performance. Accuracy, speed, and processing throughout variables as well as RMS error were collected. An automated mood survey provided 'state' information on six scales including anger, happiness, fear, depression, activity, and fatigue. An integrated and interactive LOTUS 1-2-3 macro was developed to import and display past and present task performance and mood-change information.
Author (revised)

N94-11534*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYZING HUMAN ERRORS IN FLIGHT MISSION OPERATIONS
KRISTIN J. BRUNO, LINDA L. WELZ, G. MICHAEL BARNES (California State Univ., Northridge.), and JOSEF SHERIF *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 499-505 Feb. 1993 Sponsored by NASA, Washington
Avail: CASI HC A02/MF A03

A long-term program is in progress at JPL to reduce cost and risk of flight mission operations through a defect prevention/error management program. The main thrust of this program is to create an environment in which the performance of the total system, both the human operator and the computer system, is optimized. To this end, 1580 Incident Surprise Anomaly reports (ISA's) from 1977-1991 were analyzed from the Voyager and Magellan projects. A Pareto analysis revealed that 38 percent of the errors were classified as human errors. A preliminary cluster analysis based on the Magellan human errors (204 ISA's) is presented here. The resulting clusters described the underlying relationships among the ISA's. Initial models of human error in flight mission operations are presented. Next, the Voyager ISA's will be scored and included in the analysis. Eventually, these relationships will be used to derive a theoretically motivated and empirically validated model of human error in flight mission operations. Ultimately, this analysis will be used to make continuous process improvements continuous process improvements to end-user applications and training requirements. This Total Quality Management approach will enable the management and prevention of errors in the future.
Author (revised)

N94-11536*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
VIGILANCE PROBLEMS IN ORBITER PROCESSING
WILLIAM W. SWART (University of Central Florida, Orlando.), ROBERT R. SAFFORD (University of Central Florida, Orlando.), DAVID B. KENNEDY (University of Central Florida, Orlando.), BERT A. YADI (University of Central Florida, Orlando.), and TIMOTHY S. BARTH *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 512-515 Feb. 1993
Avail: CASI HC A01/MF A03

A pilot experiment was done to determine what factors influence potential performance errors related to vigilance in Orbiter processing activities. The selected activities include post flight inspection for burned gap filler material and pre-rollout inspection for tile processing shim material. It was determined that the primary factors related to performance decrement were the color of the target and the difficulty of the target presentation.
Author (revised)

N94-11538*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
NOISE LEVELS AND THEIR EFFECTS ON SHUTTLE CREWMEMBERS' PERFORMANCE: OPERATIONAL CONCERNS
ANTON S. KOROS (Lockheed Engineering and Sciences Co., Houston, TX.), SUSAN C. ADAM, and CHARLES D. WHEELWRIGHT (Lockheed Engineering and Sciences Co., Houston, TX.) *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 522-528 Feb. 1993
(Contract NAS9-17900)
Avail: CASI HC A02/MF A03

When excessive, noise can result in sleep interference, fatigue, interference with verbal communication, and hearing damage. Shuttle crewmembers are exposed to noise throughout their mission. The contribution of noise to decrements in crew performance over these extended exposure durations was the focus

of this study. On the STS-40/SLS-1, mission noise levels were evaluated through the use of a sound level meter and a crew questionnaire. Crewmembers noted that sleep, concentration, and relaxation were negatively impacted by high noise levels. Speech Interference Levels (SIL's), calculated from the sound level measurements, suggested that crewmembers were required to raise their voice in order to be heard. No difficulty detecting caution and warning alarms was noted. The higher than desirable noise levels in Spacelab were attributed to flight specific payloads for which acoustic waivers were granted. It is recommended that current noise levels be reduced in Spacelab and the Orbiter Middeck especially as longer missions are planned for the buildup of Space Station Freedom. Levels of NC 50 are recommended in areas where speech communication is required and NC 40 in sleep areas. These levels are in accordance with the NASA Man-Systems Integration Standards. Measurements proposed for subsequent orbiter missions are discussed. Author (revised)

N94-11539*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
VISUAL EARTH OBSERVATION PERFORMANCE IN THE SPACE ENVIRONMENT. HUMAN PERFORMANCE MEASUREMENT 4: FLIGHT EXPERIMENTS
JOHN F. HUTH, JAMES D. WHITELEY, and JOHN E. HAWKER *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 529-539 Feb. 1993
Avail: CASI HC A03/MF A03

A wide variety of secondary payloads have flown on the Space Transportation System (STS) since its first flight in the 1980's. These experiments have typically addressed specific issues unique to the zero-gravity environment. Additionally, the experiments use the experience and skills of the mission and payload specialist crew members to facilitate data collection and ensure successful completion. This paper presents the results of the Terra Scout experiment, which flew aboard STS-44 in November 1991. This unique Earth Observation experiment specifically required a career imagery analyst to operate the Spaceborne Direct-View Optical System (SpaDVOS), a folded optical path telescope system designed to mount inside the shuttle on the overhead aft flight deck windows. Binoculars and a small telescope were used as backup optics. Using his imagery background, coupled with extensive target and equipment training, the payload specialist was tasked with documenting the following: (1) the utility of the equipment; (2) his ability to acquire and track ground targets; (3) the level of detail he could discern; (4) the atmospheric conditions; and (5) other in-situ elements which contributed to or detracted from his ability to analyze targets. Special emphasis was placed on the utility of a manned platform for research and development of future spaceborne sensors. The results and lessons learned from Terra Scout will be addressed including human performance and equipment design issues. Author (revised)

N94-11570*# SRI International Corp., Menlo Park, CA.
FORECASTING THE IMPACT OF VIRTUAL ENVIRONMENT TECHNOLOGY ON MAINTENANCE TRAINING
MARK S. SCHLAGER, DUANE BOMAN, TOM PIANTANIDA, and ROBERT STEPHENSON (Aerospace Medical Research Labs., Brooks AFB, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 691-699 Feb. 1993 Sponsored in part by AF
Avail: CASI HC A02/MF A03

To assist NASA and the Air Force in determining how and when to invest in virtual environment (VE) technology for maintenance training, we identified possible roles for VE technology in such training, assessed its cost-effectiveness relative to existing technologies, and formulated recommendations for a research agenda that would address instructional and system development issues involved in fielding a VE training system. In the first phase of the study, we surveyed VE developers to forecast capabilities, maturity, and estimated costs for VE component technologies. We then identified maintenance tasks and their training costs through interviews with maintenance technicians, instructors, and training developers. Ten candidate tasks were selected from two classes of maintenance tasks (seven aircraft maintenance and three space maintenance) using five criteria developed to identify types of tasks most likely to benefit from VE training. Three tasks were used as specific cases for cost-benefit analysis. In formulating research recommendations, we considered three aspects of feasibility: technological considerations, cost-effectiveness, and anticipated R&D efforts. In this paper, we describe the major findings in each of these areas and suggest research efforts that we believe will help achieve the goal of a cost-effective VE maintenance training system by the next decade. Author

N94-11701# Office of Naval Research European Office, FPO New York, NY.
THE 27TH INTERNATIONAL APPLIED MILITARY PSYCHOLOGY SYMPOSIUM: A FOCUS ON DECISION MAKING RESEARCH
STANLEY C. COLLYER 4 Aug. 1992 74 p
(AD-A265278; ONREUR-92-4-W) Avail: CASI HC A04/MF A01

The first International Applied Military Psychology Symposium (IAMPS) was held in 1963. Since then it has evolved into an important forum for information exchange among European and North American military psychologists. A wide array of topics are typically covered. These include personnel selection and classification, manpower planning, leadership, stress, training, simulation, and human factors. DTIC

N94-11867# Army War Coll., Carlisle Barracks, PA.
AVIATORS, AIR COMBAT, AND COMBAT STRESS: AN AIR F ORCE COMMANDER'S PRIMER Study Project
MARK K. WELLS 22 Feb. 1993 47 p
(AD-A265083) Avail: CASI HC A03/MF A01

There is currently no interdisciplinary study which surveys the U.S. Air Force's philosophical and organizational responses to the problems of combat fatigue or psychological collapse during the history of air war. While stress and battle shock casualties are topics of concern inside the military medical community, the subjects receive little attention from contemporary aircrew, or, more importantly, among Air Force squadron and wing commanders. This study begins with a brief look at the human dimension of airpower, examines some of the characteristics of airmen, and reviews the risky nature of the air combat environment. It goes on to describe the impact of stress on airmen and covers the Air Force's historical responses to them. More than a simple survey, however, this monograph will make specific recommendations regarding the education and training of commanders, officers, and airmen so they will be equipped to deal realistically with the potential problem of stress related casualties. DTIC

N94-11890# Naval Command, Control and Ocean Surveillance Center, San Diego, CA.
NONLINEAR RESONANCE: NOISE-ASSISTED INFORMATION PROCESSING IN PHYSICAL AND NEUROPHYSIOLOGICAL SYSTEMS
ADI BULSARA, JOHN K. DOUGLASS, and FRANK MOSS Apr. 1993 8 p
(AD-A265161) Avail: CASI HC A02/MF A01

The distinctive hiss of radio 'noise' is familiar to all of us old enough to have listened to vintage A.M. radio shows and certainly to all those personnel who ever tried to 'pull in' a weak signal during a tour in military communications. Indeed, virtually since the birth of the telephone and radio and extending to today's sophisticated telecommunications designs, engineers have devoted prodigious efforts to eliminating or minimizing the effects of noise. In consequence, an entire discipline, known as linear filter theory, has evolved and is familiar to every electrical engineering and/or communications student, usually as one or a set of rather rigorous courses. By contrast, this paper is concerned with a nonlinear filtering process known as Stochastic Resonance (SR), research on which has been supported by the Physics Division of the Office of Naval Research (ONR) for several years and more recently by the Cognitive and Neural Sciences Division of the ONR. DTIC

62

N94-12276# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

BASIC ATTRIBUTES TEST (BAT): OPERATIONAL PRE-IMPLEMENTATION ANALYSIS AND SCORE EQUATING Interim Report, Aug. 1991 - Apr. 1992

THOMAS R. CARRETTA and MALCOLM J. REE May 1993 82 p

(Contract AF PROJ. 7719)

(AD-A265885; AL-TP-1993-0015) Avail: CASI HC A05/MF A01

The Air Force will implement a new pilot candidate selection system. Scores from a multiple aptitude test (Air Force Officer Qualifying Test or AFOQT), a computer-based test (Basic Attributes Test or BAT), and biographical information will be used to compute a pilot candidate selection composite score derived from an equation designed to indicate probability of success in undergraduate pilot training (UPT). The purpose of this study was to equate the experimental and operational tests. The pre-implementation equating was necessary for the following reasons: (1) to determine whether the tests measured the same psychological constructs, (2) to compare operational score distributions, and (3) to develop equating tables. Equating was required so that scores from operational tests could be used in proposed pilot candidate selection equations developed on the experimental tests of the BAT. Experimental and operational tests were administered to about 2,000 basic recruits. Analyses were performed at the test score and composite score level and several types of equatings were completed. Adjusted correlations between the experimental and operational BAT tests were acceptable and demonstrated measurement equivalence. Differences in the shapes of the distributions (i.e., skewness, kurtosis) were observed for several of the scores between the two forms. Several types of equatings (linear, equipercentile, smoothed equipercentile) were performed to develop conversion tables for use during implementation of operational tests. Scores will be renormed to the operational test metric and a new pilot candidate selection composite will be developed after a sufficient number of applicants have been tested and have completed UPT. DTIC

N94-12929 Air Force Inst. of Tech., Wright-Patterson AFB, OH.

THE EFFECTS OF EVALUATION AND PRODUCTION BLOCKING ON THE PERFORMANCE OF BRAINSTORMING GROUPS M.S. Thesis

KEVIN D. OSTEN Aug. 1992 72 p Limited Reproducibility: Document partially illegible

(AD-A265495; AFIT/CI/CIA-92-134) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Evaluation apprehension and production blocking have been identified as possible factors leading to the reduced performance of brainstorming groups. In some experiments, high evaluation led to reduced group performance, while in other experiments performance was unaffected. The present experiment examined the effects of outside evaluation and production blocking of group performance. The resulting 2 x 2 design used responses from 171 introductory psychology students, run in same-gender groups of three. Contrary to the evaluation apprehension hypothesis, evaluation level had no significant adverse effect on group performance. In support of the production blocking hypothesis, low production blocking groups generated significantly more ideas than high production blocking groups. Satisfaction with the group experience and satisfaction with individuals and group performance were also examined. Explanations for the results are discussed as well as limitations and suggestions for future research. DTIC

N94-12975# Naval Aerospace Medical Research Lab., Pensacola, FL.

WORK/REST SCHEDULES AND PERFORMANCE OF S-3 AVIATORS DURING FLEET EXERCISE

DAVID F. NERI and SCOTT A. SHAPPELL Mar. 1993 18 p

(AD-A265807; NAMRL-1382) Avail: CASI HC A03/MF A01

We examined the effect that a fleet exercise has on the work/rest patterns, fatigue, and cognitive performance of S-3 aviators. For 10 days during Fleet Exercise 1992, twenty-one S-3 aviators from Carrier Air Wing Seventeen (CVW-17) aboard USS Saratoga (CV-60) completed detailed daily-activity logs while performing their usual tasks. Subjective measures of fatigue, quality of rest, and sleep need were also collected. A subset of eight aviators completed a brief battery of computer tasks as soon before flying as possible and again after flight debrief. Results indicated that, although the fleet exercise appeared to be below average in difficulty, there were statistically significant performance changes from pre- to postflight on a fatigue-sensitive reaction time task. Average sleep onset was delayed over the course of the fleet exercise, peaking at past 0300 by day 8. A continuation of this pattern could lead to circadian desynchrony and serious sleep problems. Responses to questions on fatigue, sleep need, and readiness to fly a strike mission were consistent with circadian factors. Further research in this area is needed to determine the magnitude and extent of this problem. We recommend that additional data be collected on a variety of fleet exercises with particular effort made to include S-3 squadrons affected by the reductions in manning and increased tasking. The additional data will provide an objective means of fully evaluating the impact of these operational changes on the S-3 community. DTIC

N94-12982# Naval Aerospace Medical Research Lab., Pensacola, FL.

WORK/REST SCHEDULES AND PERFORMANCE OF F/A-18 AVIATORS DURING FLEET EXERCISE 1992

S. A. SHAPPELL and D. F. NERI Apr. 1993 29 p

(AD-A265826; NAMRL-1383) Avail: CASI HC A03/MF A01

As a continuation of our previous work during Operation Desert Shield/Storm, we examined the effect a fleet exercise has on the work/rest patterns, fatigue, and cognitive performance of F/A-18 aviators. For 10 days during Fleet Exercise 1992, 25 pilots from VFA-81 and VFA-83 completed daily work/rest logs while performing their usual tasks. Subjective measure of fatigue, quality of rest, and sleep need were also collected. A subset of these F/A-18 pilots completed a brief battery of cognitive tasks as soon before flying as possible and again after the flight debrief. As a group, the pilots were adequately rested with little or no problem sleeping, and they operated on a typical work/rest schedule for deployed F/A-18 aviators. However, in some instances during which late night missions were flown, sleep onset was delayed, coupled with shorter sleep periods and additional sleep problems. Several work/rest and flight related parameters were related to subjective measures of aircrew combat readiness, including the following: (1) flight quartile, (2) number and order of flights per day, (3) flight duration, (4) flight hours during the 72 h before a mission, (5) total work during the 24 h before a mission, (6) total sleep during the 12 h before a mission, and (7) total hours continuously awake before a mission. All seven variables significantly contributed to a multiple regression model derived using subjective strike delay, accounting for 51 percent of the variance. Moreover, statistically significant changes were observed from pre- to postflight on a fatigue-sensitive reaction time task. DTIC

N94-13314*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

VISUAL INFORMATION FOR JUDGING TEMPORAL RANGE

MARY K. KAISER and LYN MOWAFY (Dayton Univ. Research Inst., Higley, AZ.) *In its* Piloting Vertical Flight Aircraft: A Conference on Flying Qualities and Human Factors p 309-313 Jul. 1993

Avail: CASI HC A01/MF A04

Work in our laboratory suggests that pilots can extract temporal range information (i.e., the time to pass a given waypoint) directly from out-the-window motion information. This extraction does not require the use of velocity or distance, but rather operates solely on a 2-D motion cue. In this paper, we present the mathematical derivation of this information, psychophysical evidence of human observers' sensitivity, and possible advantages and limitations of basing vehicle control on this parameter. Author

N94-13442# University of Electro-Communications, Tokyo (Japan).

HEIDEGGER'S THINKING

ICHIRO AKANUMA *In its* Bulletin of the University of Electro-Communications, Volume 6, No. 1, Serial No. 11 p 97-106 Jun. 1993 In JAPANESE
Avail: CASI HC A02/MF A02

In Heidegger's 'Was heist Denken? (= What is called thinking?)', we meet with a shocking statement 'Die Wissenschaft denkt nicht (= Science does not think.)'. Considering what he truly means by these words, I would like to pursue his way of thinking and his ultimate aim in philosophy. In his lecture 'Gelassenheit (releasement)' given at his home town, Heidegger emphasizes the importance of 'Besinnung (meditative thinking)' in contrast with the overwhelming thinking of today, that is, 'das rechnende Denken (calculative thinking)'. This 'meditative thinking' is what Heidegger has in mind when he says 'science does not think.' I want to reflect upon the way of our life in the age of science and technology through listening to his speech carefully.
Author (revised)

N94-13582# Aerospace Medical Research Labs., Brooks AFB, TX.
THE IDENTIFICATION OF ABILITY REQUIREMENTS AND SELECTION INSTRUMENTS FOR FIGHTER PILOT TRAINING Interim Report, Jan. - Aug. 1992
THOMAS R. CARRETTA, MICHAEL N. RODGERS, and IVAR HANSEN Jun. 1993 48 p
(AD-A266340; AL/HR-TP-1993-0016) Avail: CASI HC A03/MF A01

Forty-three experienced fighter pilots from Canada, Norway, and the United States served as subject matter experts (SME's) in an effort to determine the relative importance of 27 personnel characteristics for fighter pilot performance. Inter-rater reliability estimates indicated an acceptable level of agreement for SME's within each country and between pairs of countries regarding the relative importance of the 27 characteristics. Because there was sufficient agreement among SME's from the three countries, the average ranking of the 27 characteristics was calculated. Based on these results, aviation psychologists from Canada, Denmark, the Netherlands, Norway, the United Kingdom, and the United States reviewed selection instruments currently in use in NATO member countries, to identify the most promising selection instruments for inclusion in a computer-based fighter pilot test battery. Their recommendations are summarized in the paper.
DTIC

N94-13961*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN EVALUATION OF NOISE AND ITS EFFECTS ON SHUTTLE CREWMEMBERS DURING STS-50/USML-1
ANTON KOROS (Lockheed Engineering and Sciences Co., Houston, TX.), CHARLES WHEELWRIGHT (Lockheed Engineering and Sciences Co., Houston, TX.), and SUSAN ADAM Sep. 1993 51 p
(NASA-TM-104775; S-729; NAS 1.15:104775) Avail: CASI HC A04/MF A01

High noise levels can lead to physiological, psychological, and performance effects in man, ranging from irritability, annoyance, and sleep interference to interference with verbal communication and fatigue, and to temporary or permanent threshold shift at more extreme levels. The current study evaluated the acoustic environment of the STS50/USML-1 mission. The major objectives were to gain subjective assessments of the STS-50 noise levels, document impacts of noise upon crewmember performance, collect inflight sound level measurements, compare noise levels across missions, evaluate the current Shuttle acoustic criterion, and to make recommendations regarding noise specifications for SSF and other long-duration manned space missions. Sound measurements indicated that background noise levels were 60, 64, and 61 A-weighted decibels, respectively, on the Orbiter middeck, flight deck, and Space lab. All levels were rated acceptable, with the Spacelab environment rated the most favorably. Sleep stations afforded attenuation from airborne noise sources, although all crewmembers reported being awakened by crew activity on the middeck. Models of distance for acceptable speech communications were generated, identifying situations of compromised verbal communications to be avoided.
Author

N94-14797# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.
DEPTHS FROM FOCUSING AND DEFOCUSING
NICOLA MUSCETTOLA Mar. 1993 29 p
(Contract F33615-90-C-1465; ARPA ORDER 7597)
(AD-A266644; CMU-RI-TR-93-07) Avail: CASI HC A03/MF A01

This paper studies the problem of obtaining depth information from focusing and defocusing, which have long been noticed as important sources of depth information for human and machine vision. In depth from focusing, we try to eliminate the local maxima problem which is the main source of inaccuracy in focusing; in depth from defocusing, a new computational model is proposed to achieve higher accuracy. The major contributions of this paper are as follows: (1) in depth from focusing, instead of the popular Fibonacci search which is often trapped in local maxima, we propose the combination of Fibonacci search and curve fitting, which leads to an unprecedentedly accurate result; (2) a new model of the blurring effect is presented which takes the geometric blurring as well as the imaging blurring into consideration and the calibration of the blurring model; and (3) in spectrogram-based depth from defocusing, an iterative estimation method is proposed to decrease or eliminate the window effect. This paper reports focus ranging with less than 1/1000 error and the defocus ranging with about 1/200 error. With this precision, depth from focus ranging is becoming competitive with stereo vision for reconstructing 3D depth information.
DTIC

N94-14846# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
VALIDITY OF FAA-APPROVED COLOR VISION TESTS FOR CLASS 2 AND CLASS 3 AEROMEDICAL SCREENING Final Report
HENRY W. MERTENS and NELDA J. MILBURN Sep. 1993 13 p
(DOT/FAA/AM-93/17) Avail: CASI HC A03/MF A01

All clinical color vision tests currently used in the medical examination of pilots were studied regarding validity for prediction of performance on practical tests of ability to discriminate the aviation signal colors, red, green, and white given under both day and night conditions. Those same practical tests are given to pilots with color vision deficiency who apply for a waiver of the Class 2 or Class 3 color vision standards. Subjects with varying type and degree of color vision deficiency (n=122) and subjects with normal color vision (n=120) were classified with the anomaloscope and given both practical and clinical tests. The clinical color vision tests included the American Optical Company plates (1965 and 1940 Editions), AOCHRR plates (2nd Edition), Ishihara plates (14-, 16-, 24-, and 38-plate tests), Dvorine plates, Richmond plates, Farnsworth Lantern, School of Aviation Medicine Color Threshold Tester, Titmus Tester, Titmus II Tester, OPTEC 2000 Tester, and Keystone Orthoscope/Telebinocular test. The criterion tests required naming the colors of actual signals produced by the Aviation Signal Light, with the same test procedures and viewing distances used in actual practical tests. The Farnsworth Lantern and several plate tests were the best clinical tests for predicting ability to identify the colors of aviation signals. Individuals with color vision deficiency identified signal colors better at night than during the day. Recommendations for improving the disposition criteria of some clinical tests, and for discontinuing several obsolete tests are discussed.
Author (revised)

N94-14854# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
VALIDATION OF AN INEXPENSIVE ILLUMINANT FOR AEROMEDICAL COLOR VISION SCREENING Final Report
NELDA J. MILBURN and HENRY W. MERTENS Sep. 1993 9 p
(DOT/FAA/AM-93/16) Avail: CASI HC A02/MF A01

An inexpensive illuminant for color vision screening suggested

by the NRC-NAS Committee on Vision was evaluated as a substitute for the Macbeth Easel Lamp. The Macbeth Easel Lamp is the recommended illuminant for pseudoisochromatic plate tests used in aeromedical color vision screening, but is no longer in production. Subjects included both normal trichromats (p = 145) and persons with varying degrees and types of color vision deficiencies (p = 152) as diagnosed with the Nagel Type I anomaloscope. Subjects were given the Dvorine Pseudo-Isochromatic Plate Test illuminated by each of the two light sources. One Verilux True Color Light tube (F15T8VLX) was installed in an adjustable fluorescent desk lamp and positioned at a height of 24 in above the center of the Dvorine test book to give a 270 lux illumination to match the illumination produced by the Macbeth light source. The two presentations of the Dvorine were separated by several other color vision tests. Each subject was given a different random order of plates 2-15 for each light source. Pass/Fail performance with the Dvorine test was virtually the same with the two light sources when criterion for failure was three or more errors. The Verilux True Color Light obtained a Kappa value of .97, and very low false positive (.021) and false negative (.006) rates when compared to the Macbeth Easel Lamp. Performance and possible applications of the Verilux True Color Light in aeromedical color vision screening are discussed.

Author (revised)

N94-15108# Dayton Univ., OH. Research Inst.

AN INFORMATION PROCESSING CLASSIFICATION OF BEYOND-VISUAL-RANGE AIR INTERCEPTS Final Technical Report, Jan. - Dec. 1991

MICHAEL R. HOUCK, LESLIE A. WHITAKER, and ROBERT R. KENDALL May 1993 53 p

(Contract F33615-90-C-0005)

(AD-A266927; AL/HR-TR-1993-0061) Avail: CASI HC A04/MF A01

This research produced a descriptive classification of the task behaviors and cognitive processing associated with performing a beyond-visual-range (BVR) air combat mission. An F-15C defensive counter air mission scenario was analyzed to identify the critical tactical decisions required of the pilot, the information that must be processed in order to make these decisions, and the overt behaviors associated with pilots' information processing. The goal of this classification scheme was to determine observable behaviors that can be used as overt indicators of cognitive information processing. For future research purposes, the classification will provide a framework for identifying observable task behaviors that may be worthy candidates for developing and testing measures of performance. Such measures are essential for assessing the effectiveness of simulator-based training programs for enhancing the cognitive skills necessary for BVR employment. DTIC

N94-15148# Illinois Univ., Champaign.

THE 12TH ANNUAL CARMEL CONFERENCE, DISTINCTIVENESS AND MEMORY: COGNITIVE PSYCHOPHYSIOLOGICAL AND PHYSIOLOGICAL CONSIDERATIONS Final Report, 10 Jan. 1992

EMANUEL DONCHIN 10 Jun. 1993 12 p Conference held in Carmel Highland, CA, 5-10 Jan. 1992

(Contract F49620-92-J-0102)

(AD-A267181; AFOSR-93-0525TR) Avail: CASI HC A03/MF A01

A workshop concerned with the integration of data obtained by a number of recently developed imaging methods with data obtained by more traditional means was conducted in Carmel Highlands, California, January 5-10, 1992. The thirty-four attendees focused, as a context for considering the challenge of integration, on the degree to which converging information makes it possible to develop models accounting for the effects of distinctiveness on recall, with particular emphasis on models of hippocampal function. Special consideration was given to the relationship between scalp recordings of ERP's and the neuroanatomical information that can be obtained on related processes by MRI, PET, numerical estimation procedures, and the study of focal lesions. The conference paid particular attention to the need to develop a common vocabulary and novel research paradigms if we are to gain the full benefits of current technological innovations. DTIC

N94-15237* National Aeronautics and Space Administration, Washington, DC.

TEACHER IN SPACE (Videotape)

Dec. 1985 Videotape: 4 min. 50 sec. playing time, in color, with sound

(NASA-TM-109666; NONP-VT-93-190464) Avail: CASI VHS A01/BETA A22

This video presentation covers the Teacher in Space program from the competition and selection process to the training of Christa McAuliffe and Barbara Morgan. CASI

N94-15499* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ASTRONAUTS NUMBER 1 (Videotape)

Sep. 1988 Videotape: 28 min. 51 sec. playing time, in color, with sound

(NASA-TM-109428; NONP-VT-93-190225) Avail: CASI VHS A01/BETA A22

The story of the selection and training of the seven Mercury astronauts is presented. A re-release of US Project Mercury. CASI

N94-15659# Army Aeromedical Research Lab., Fort Rucker, AL.

ACTIVITY/REST PATTERNS OF INSTRUCTOR AND RATES STUDENT PILOTS DURING RAPID TRANSITIONS FROM DAYTIME TO NIGHTTIME DUTY HOURS AT THE EASTERN ARMY AVIATION TRAINING SITE

CARLOS A. COMPERATORE, JAMES A. CHIARAMONTE, JACQUELYN Y. PEARSON, LEWIS W. STONE, and GERALD L. HESS Feb. 1993 62 p

(Contract DA PROJ. 3M1-62787-A-879)

(AD-A267038; USAARL-93-16) Avail: CASI HC A04/MF A01

Rapid shifts in work schedules demand that pilots and aircrew quickly adapt to new sleep schedules. Transitions to nighttime duty hours lacking planned work/rest schedules can result in the delay of physiological and cognitive adaptation, fatigue, and performance degradation (shift lag). The objective of this study was to determine the effects of a night shift coping strategy in the adaptation of helicopter pilots (UH-1) to nighttime (2100 to 0100) flying schedules. Daily activity/rest rhythms of instructor and rated student pilots (IP's/RSP's) were monitored 24 h perday for a total of 21 to 28 days using individual wrist activity monitors. RSP's (n = 6) lived in dormitories with complete blocking of daylight (below 10 lux) and reduced environmental noise until 1000. Meals and academic activities were scheduled to all RSP's the opportunity to sleep until 1000 after night flights. IP's lived in private homes and were expected to meet administrative, academic, and flight instruction demands. Throughout the NVG course, RSP's elected to retire between 0040 and 0200, to rise at approximately 0900, and to delay morning daylight exposure between 0900 1000. This schedule of activities resulted in an average of 7 h of bedrest under both daytime and nighttime duty schedules. In contrast, IP's exhibited variable rise times, usually occurring between 0700 and 0830 during both daytime and nighttime duty schedules. After night flights, IP's exhibited a delay of bedtime (2 h) but failed to consistently delay rise times. DTIC

N94-15694# Harvard Univ., Cambridge, MA.

COOPERATIVITY AND 3-D REPRESENTATION Annual Technical Report, 1 Feb. 1992 - 31 Jan. 1993

PATRICK CAVANAGH 28 Feb. 1993 7 p

(Contract AF-AFOSR-0169-91)

(AD-A267180; AFOSR-93-0547TR) Avail: CASI HC A02/MF A01

Recent evidence indicates that the early stages in visual processing may be broken into several parallel streams that are specialized for the analysis of different visual attributes. A contour localization task showed that all attributes can contribute equally to border localization no particular attribute dominated position decisions. A series of experiments on transparency perception

showed that transparency is analyzed rapidly (within 60 msec) and influences early levels of visual processing. We have also investigated the early stages that lead from the initial 2D representation to object recognition. Visual priming studies have been completed which suggest that object recognition begins, not with the construction of a 3-D model, but with a crude match of 2-D views to internal prototypes. The prototype that has the best match then guides the construction of an internal 3-D model. An analysis of drawing techniques has led to ideas about memory codes for the depth structure of an image and to simplified mechanisms for understanding shadows and shading and to renewed interest in 'isophot' models of shading. Visual search studies have shown that some scene features may be rapidly suppressed. For example, shadows appear to be identified early and discounted in order to allow object contours to be processed. Finally, long-term practice in visual search tasks leads to learning of both object-centered and retinotopic properties of the stimuli. DTIC

N94-15742# Carnegie-Mellon Univ., Pittsburgh, PA. School of Computer Science.

COMPLEXITY ANALYSIS OF REAL-TIME REINFORCEMENT LEARNING APPLIED TO FINDING SHORTEST PATHS IN DETERMINISTIC DOMAINS

SVEN KOENIG and REID G. SIMMONS Dec. 1992 102 p

(AD-A266636; CMU-CS-93-106) Avail: CASI HC A06/MF A02

This report analyzes the complexity of on-line reinforcement learning algorithms, namely asynchronous real-time versions of Q-learning and value-iteration, applied to the problems of reaching any goal state from the given start state and finding shortest paths from all states to a goal state. Previous work had concluded that, in many cases, initially uninformed (i.e. tabula rasa) reinforcement learning was exponential for such problems, or that it was tractable (i.e. of polynomial time-complexity) only if the learning algorithm was augmented. We prove that, to the contrary, the algorithms are tractable with only a simple change in the task representation (penalizing the agent for action executions) or initialization (initializing high). We provide tight bounds on their worst-case complexity, and show how the complexity is even smaller if the state space has certain special properties. We compare these reinforcement learning algorithms to other uninformed on-line search methods and to informed off-line search methods and investigate how initial knowledge of the topology of the state space can decrease their complexity. We also present two novel algorithms, the bi-directional Q-learning algorithms and the bi-directional value-iteration algorithm, for finding shortest paths from all states to a goal state and show that they are no more complex than their counterparts for reaching a goal state from a given start state. The worst-case analysis of the reinforcement learning algorithms is complemented by an empirical study of their average-case complexity in three domains. DTIC

N94-15762 Vanderbilt Univ., Nashville, TN.

COMPLEX INFORMATION COORDINATION PERFORMANCE: DIFFERENTIAL CHANGES IN WORKING MEMORY CONTRIBUTIONS FOLLOWING TRAINING Final Report

DAVID J. LAW, KEVIN A. MORRIN, and JAMES W. PELLEGRINO 30 Jun. 1993 70 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-91-J-1709; NR PROJ. S11-42-CS)

(AD-A267007) Avail: CASI HC A04

Yee, Hunt, and Pellegrino introduced the concept of information coordination tasks--tasks that require the concurrent performance of two or more component tasks and the subsequent coordination of component information. In the present experiment different procedures, componential and contextual, were used to train separate groups (N = 35, N = 33) in a coordination task that involved dynamic spatial and verbal components. Within and between group analyses indicated that post-training performance improved and the improvement was equivalent across treatments. However, individual differences analyses indicated the treatments promoted different ability-performance profiles, which were related to differential dependencies on working memory resources. The differential dependence on working memory appears related to the functional consistency of information in the different treatments. Further analyses indicated that both treatments fostered the coordination of the dynamic spatial information within the relative arrival time task--a dynamic spatial coordination task. Sensitivity to relative velocity, working memory capacity, verbal processing ability, and gender mediated whether individuals became coordinators of dynamic spatial information. The broad implications of this study include the importance of combining mean and individual differences analyses in studies of human cognition. DTIC

N94-15911*# General Electric Co., Moorestown, NJ. Astro Space Div.

SAR SENSOR ELECTRONICS: T/R MODULES

MOHD A. HASAN and ALBERT E. PREYSS *In* JPL, Proceedings of the Third Spaceborne Imaging Radar Symposium p 381-402 28 May 1993

Avail: CASI HC A03/MF A04

A discussion concerning the architecture of transmit/receive (T/R) modules in synthetic aperture radar (SAR) systems is presented. Module requirements are discussed in the context of the following: requirements traceability; antenna configuration; and typical module specifications/requirements. Finally, module technology development in the L-, C-, and X-bands is discussed. CASI

N94-15938# Haifa Univ. (Israel).

SCUBA-DIVING, ANXIETY AND TASK PERFORMANCE

BARUCH NEVO and MOSHE ZEIDNER 1984 18 p

Avail: CASI HC A03/MF A01

This study was primarily designed to examine the effect of scuba-diving on anxiety and cognitive performance in divers. In addition, this study experimentally tested the validity of the state-trait anxiety distinction. The sample was composed of 7 female and 6 male university students. Using a repeated measures design counterbalanced for testing conditions, subjects were administered a series of cognitive and anxiety measures both on land and when scuba-diving underwater. Whereas Trait-Anxiety scores were not significantly elevated by diving, State-Anxiety scores and heartbeat were significantly higher when diving underwater compared to surface conditions. Time estimation was significantly impacted by diving conditions, with subjects providing shorter time estimates for underwater conditions relative to control conditions. However, diving had no significant impact upon either the quantity or quality of simple math calculations. Overall, there is a tendency for diving conditions to impact upon some cognitive measures but not others. Since only state scores, but not trait scores, were affected by the experimental conditions, this study provides additional support for the construct validity of the State-Trait Anxiety Inventory in differentiating between anxiety as a state and trait. Author

N94-16456# Johns Hopkins Univ., Baltimore, MD. Dept. of Psychology.

NEURAL MECHANISMS OF ATTENTION Final Technical Report, 15 Dec. 1990 - 14 Nov 1992

DAVID S. OLTON, KEVIN PANG, and HOWARD EGETH 21 May 1993 125 p

(Contract AF-AFOSR-0110-91)

(AD-A266315; AFOSR-93-0454TR) Avail: CASI HC A06/MF A02

This project was successful in examining the neural mechanisms involved in attention. An important outcome is the conclusion that modification of neural transmission by attentional processes takes place in many different places in the nervous system and at many different levels of information processing. Animal models of attentional processes are being developed that allow more extensive analysis of the neuroplastic changes involved in attention. The field of attention is now able to proceed in an integrated fashion similar to the way that memory has been pursued. DTIC

N94-16617*# Office of Personnel Management, Washington, DC.
PROGRAMS AND RESOURCES FOR CONTROL OF JOB STRESS IN THE FEDERAL WORKPLACE
WENDELL JOICE *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 91-98 Jul. 1993
Avail: CASI HC A02/MF A03

A couple of weeks ago, the American Psychological Association and the National Institute of Occupational Safety and Health held a conference in Washington, D.C. entitled 'Stress in the 90's'. At this conference the Office of Personnel Management (OPM) conducted a session on 'Programs and Resources for the Control of Job Stress in the Federal Workplace'. I am going to present an overview of that three-hour session and some related information from the conference. My discussion covers stress terminology and models, selected programs and resources, evaluation research, some concerns about our progress, and plans to expand our efforts at OPM. Author (revised)

N94-16819# Sandia National Labs., Albuquerque, NM.
A COMPUTER-BASED TRAINING SYSTEM COMBINING VIRTUAL REALITY AND MULTIMEDIA
S. A. STANSFIELD 28 Apr. 1993 8 p Presented at the 1993 Conference on Intelligent, Computer-Aided Training and Virtual Environments, Houston, TX, 5-7 May 1993
(Contract DE-AC04-76DP-00789)
(DE93-013768; SAND-93-0967C; CONF-9305194-1) Avail: CASI HC A02/MF A01

Training new users of complex machines is often an expensive and time-consuming process. This is particularly true for special purpose systems, such as those frequently encountered in DOE applications. This paper presents a computer-based training system intended as a partial solution to this problem. The system extends the basic virtual reality (VR) training paradigm by adding a multimedia component which may be accessed during interaction with the virtual environment. The 3D model used to create the virtual reality is also used as the primary navigation tool through the associated multimedia. This method exploits the natural mapping between a virtual world and the real world that it represents to provide a more intuitive way for the student to interact with all forms of information about the system. DOE

N94-16925# Rochester Univ., NY. Center for Visual Science.
REFERENCE FRAMES IN VISION Annual Report, 15 Feb. 1992 - 14 Feb. 1993
MARY M. HAYHOE 26 May 1993 5 p
(Contract AF-AFOSR-0332-91)
(AD-A266174; AFOSR-93-0422TR) Avail: CASI HC A01/MF A01

This research examines the consequences of observer motion for visual functioning. Two major visual issues are addressed. The first issue is how a grossly time-varying retinal input (due to eye, head, and body motion) results in the perception of a continuous and directionally stable world. The second issue concerns the relatedness of the visual information that is retained from previous viewing. An examination of 'deictic primitives' (e.g., fixation points) and their importance for accurate internal representations is being investigated by covarying the temporal access to the sensory input during the problem solving process. Preliminary observations reveal some notable features of the-eye and head coordination: (1) Head movement frequently leads the gaze change, and (2) The fraction of gaze shift due to head movement varied from 20% for short, vertical movements, to nearly 100% for large horizontal movements. It was in general dependent on the sub-task, and was larger for horizontal than vertical gaze changes. In addition, it was shown that the gaze moved first to the model area, then is refined down to the workspace, while the head simply moves to the model area. DTIC

N94-16942# Southeastern Center for Electrical Engineering Education, Inc., Saint Cloud, FL.
STATES OF AWARENESS 1: SUBLIMINAL PERCEPTION RELATIONSHIP TO SITUATIONAL AWARENESS Final Report, 30 Nov. 1988 - 31 May 1991
GRANT E. SECRIST and BRYCE O. HARTMAN May 1993 67 p
(Contract AF PROJ. 7755)
(AD-A267249; AL-TR-1992-0085) Avail: CASI HC A04/MF A01

On the face of it, subliminal perception violates common sense. How can a stimulus for which you have no knowledge make any difference? In its simplest terms, the answer is as follows. When you have a known stimulus at a known intensity, which is at or below the level of conscious awareness, and behavior on a concurrent or subsequent task is modified, then you have a subliminal perception. This report reviews and integrates the literature on subliminal perception. We review the history (early research was weak) and theoretical roots. Then we examine in detail the five prominent methodologies: signal detection; dual channel; masking; lexical decision; and neurophysiologic--the latter very briefly. The main part of the review addresses two major areas: Subthreshold information acquisition; and subconscious information processing. Current criticisms are examined. Operational relevance is discussed. The significance of subliminal perception for operational applications is that it provides a methodological basis for one kind of training to enhance situational awareness. DTIC

N94-17020# Rochester Univ., NY. Center for Visual Science.
LOCALIZING VISUAL FUNCTION IN THE BRAIN Final Report, 1 Jun. 1992 - 31 Jan. 1993
WILLIAM H. MERIGAN 13 Aug. 1992 16 p
(Contract F49620-92-J-0369)
(AD-A267381; AFOSR-93-0527TR) Avail: CASI HC A03/MF A01

The subject of 'Localizing Visual Function in the Brain' was discussed at a three-day meeting in Rochester. The meeting consisted of presentations by 15 prominent scientists of topics including the following: the anatomy of modular connections in the primate visual system; computational advantages of modular organization; imaging of the function of visual cortex; and physiological and behavioral evidence of modular processing. Each group of presentations was followed by a wide ranging discussion of the theme of the session. An audience of about 200 researchers and students included visual and computational scientists, neurologists, and radiologists, as well as a diverse group of investigators (largely physicists and engineers) interested in brain imaging. Many participants felt that it was an unusually productive meeting because of the broad range of related issues covered and the, at times intense, discussions that filled the meeting. DTIC

N94-17022# Brown Univ., Providence, RI. Inst. for Brain and Neural Systems.
THEORETICAL AND EXPERIMENTAL RESEARCH INTO BIOLOGICAL MECHANISMS UNDERLYING LEARNING AND MEMORY
30 Jun. 1993 34 p
(Contract N00014-91-J-1316)
(AD-A267441) Avail: CASI HC A03/MF A01

This is written to provide a semi-annual progress report for the contract N00014-91-J-1316 entitled 'Theoretical and Experimental Research into Biological Mechanisms Underlying Learning and Memory.' The major goal of our research is to elucidate the biological mechanisms that underlie learning and memory: to find principles of organization that can account both for experimental data on the cellular level and, when applied to large numbers of neurons that receive sensory and/or interneuronal information, for various higher level system properties. Among our detailed objectives are the following: to clarify the dependence of learning on synaptic modification; to elucidate the principles that govern synapse formation or modification; and to use principles of organization that can account for observations on a cellular

level to construct neural-like systems that can learn, associate, and reproduce such higher level cognitive acts as abstraction and computation. DTIC

N94-17265# California Univ., San Diego, La Jolla.
NEURAL BASIS OF MOTION PERCEPTION Final Report, 1 Jun. 1990 - 31 May 1992
V. S. RAMACHANDRAN 18 Feb. 1993 6 p
(Contract AF-AFOSR-0414-89)
(AD-A267267; AFOSR-93-0464TR) Avail: CASI HC A02/MF A01

Our research has been concerned with visual surface representation and the manner in which visual image segmentation influences certain early visual processes such as stereopsis, motion correspondence, structure from motion, shape from shading, and the aperture problem. A number of new visual effects in our laboratory (e.g., motion capture, stereoscopic capture, etc.) have given us novel insights into the mechanisms underlying human motion perception and stereopsis. DTIC

N94-17296*# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
ACQUISITION AND PRODUCTION OF SKILLED BEHAVIOR IN DYNAMIC DECISION-MAKING TASKS Final Report
ALEX KIRLIK 12 Nov. 1993 30 p
(Contract NAG2-656)
(NASA-CR-194658; NAS 1.26:194658) Avail: CASI HC A03/MF A01

Summaries of the four projects completed during the performance of this research are included. The four projects described are: Perceptual Augmentation Aiding for Situation Assessment, Perceptual Augmentation Aiding for Dynamic Decision-Making and Control, Action Advisory Aiding for Dynamic Decision-Making and Control, and Display Design to Support Time-Constrained Route Optimization. Papers based on each of these projects are currently in preparation. The theoretical framework upon which the first three projects are based, Ecological Task Analysis, was also developed during the performance of this research, and is described in a previous report. A project concerned with modeling strategies in human control of a dynamic system was also completed during the performance of this research. Author (revised)

N94-17397 Harvard Univ., Cambridge, MA. Div. of Applied Sciences.
THE EFFECTS OF LUMINANCE BOUNDARIES ON COLOR PERCEPTION Final Report, 15 Mar. 1989 - 14 Jan. 1993
RICHARD E. KRONAUER, CHARLES F. STROMEYER, III, and ALEX CHAPARRO 20 Jul. 1993 39 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0304-89)
(AD-A268398) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The luminance and red-green chromatic detection mechanisms respond to, respectively, the sum and difference of the long-wave (L) and middle-wave (M) cone contrast signals. The most-detectable stimulus is not a small patch of luminance drifting grating, as suggested by others, but rather a small, foveal red-green chromatic flash. Even at the smallest test size examined, 2.3 ft. diameter, the red-green mechanism is more sensitive than the luminance mechanism, which has profound implication for visual physiology. When a suprathreshold luminance flash (a pedestal) occurs coincidentally with a red-green chromatic flash, detection of color is facilitated approximately 2-fold, regardless of spot size, as shown by forced-choice results, and this constant facilitation contrasts with the much larger facilitation reported earlier for small flashes. The lack of chromatic masking by suprathreshold luminance pedestals supports the view of separable luminance and red-green detectors. DTIC

N94-17453# California Univ., Irvine. Center for the Neurobiology of Learning and Memory.
SYNAPTIC PLASTICITY AND MEMORY FORMATION Annual Technical Report, 1 Jun. 1992 - 31 May 1993
GARY LYNCH 30 Jun. 1993 5 p
(Contract F49620-92-J-0307)
(AD-A267988; AFOSR-93-0565TR) Avail: CASI HC A01/MF A01

The physiological effect known as long-term potentiation (LTP) is widely suspected of being the substrate of several forms of memory encoded by synapses in the forebrain of humans and other mammals. Work in the past year established that translational suppression with antisense oligonucleotides of one of the subunits of the AMPA (glutamate) transmitter receptor blocks the capacity of synapses to exhibit LTP. This confirms the hypothesis that the AMPA receptor is the agent of LTP expression. Changes in the waveform of the synaptic responses were found to occur in conjunction with LTP and were suggestive of a shift in the kinetic properties of the AMPA receptor channel. Computer simulations of the receptor led to the discovery that all known phenomenology of LTP expression can be reproduced by simply increasing the rates at which the receptor channel opens and closes. In parallel studies, a drug which acts on the AMPA receptor channel was shown to facilitate the induction of LTP. This led to a drug development program to find potent compounds of this kind which cross the blood-brain barrier and enhance the AMPA receptor and LTP in behaving rats. This effort was successful and one of the new drugs was then tested extensively in large numbers of rats across three learning tasks; as predicted, this compound produced substantial improvements in the encoding of short and long-term memories. DTIC

N94-17468# Wisconsin Univ., Madison. Dept. of Psychology.
PROCESSES INVOLVED IN THE INTEGRATION OF PICTURES AND DISCOURSE Annual Report, 1 Jun. 1992 - 31 May 1993
ARTHUR GLENBERG 7 Jul. 1993 2 p
(Contract F49620-92-J-0310)
(AD-A268150; AFOSR-93-0615TR) Avail: CASI HC A01/MF A01

During the period 7/92 to 6/93 Peter Kruley conducted experiments studying the comprehension of illustrated texts; he took a leading role in designing the experiments, writing and debugging computer programs used in the collection of data, collecting actual subject data, and analyzing the data. In two experiments conducted from June to Nov. 1992, subjects read scientific texts, either with or without illustrations, while simultaneously performing tasks that stressed working memory. The goal of the experiments was to investigate the contribution of spatial and non-spatial working memory to the comprehension of texts; the results showed that performance of a concurrent spatial task was impaired when subjects read illustrated texts, whereas performance of a non-spatial task was not so impaired. Thus evidence was found for on-line use of the visuo-spatial sketchpad during comprehension of illustrated texts. DTIC

N94-17510# Krug Life Sciences, Inc., San Antonio, TX.
A VIRTUAL ACOUSTIC ORIENTATION INSTRUMENT Final Report, Nov. 1991 - 1992
DON C. TEAS Jan. 1993 44 p
(Contract F33615-89-C-0603)
(AD-A268181; AL-TR-1992-0157) Avail: CASI HC A03/MF A01

Virtual instrumentation developed to create acoustic stimuli for use as orientation signals and the rationale for selecting these target signals is described. A commercially available computer-assisted software engineered programming system, LabVIEW, was used to develop the acoustic signals and the manner of their presentation. Two different acoustic signals are presented. One sound seems to change pitch without limit, and the other is a narrow band-pass noise. The pitch, loudness, and lateral position of the signals are controlled by different functions. Listeners can control the variations in pitch and lateralization and also the rate at which these features change. Programs to generate the signals with sinusoids or with noise bands are described. LabVIEW representations of the programs are included with text descriptions. DTIC

N94-17513 Retina Foundation, Boston, MA. Eye Research Inst.
PERCEPTION OF LIGHTNESS AND BRIGHTNESS IN COMPLEX PATTERNS Final Report, 1 May 1991 - 30 Apr. 1993
LAWRENCE E. AREND, JR. 30 Jun. 1993 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0377-89)
(AD-A268435; AFOSR-93-0617TR) Avail: CASI HC A03

Perception of surface color plays an important part in many everyday visual tasks. Psychophysical and neurophysiological data on early visual processes suggest a number of potential sensory limitations on the accuracy of surface-color perception. A new paradigm has been used to clarify the relationships between early visual processes and perception of achromatic surface colors (shades of gray). Psychophysical measurements of perceived surface color were made using achromatic stimulus patterns that were complex enough to support unambiguous perception of surfaces and lights. Lightness (apparent reflectance), brightness (apparent luminance) and local brightness contrasts were all measured using the same stimulus patterns. According to a number of models, lightness is closely related to local brightness contrast, but the data indicated that the relationship is more complicated than previously supposed. The brightness contrast data are well described by Stiles' threshold-vs-radiance curve, which is widely thought to be a characteristic of retinal adaptation processes. Both brightness and lightness are slightly higher on dark gray backgrounds than on white backgrounds. This perceptual error appears to be independent of illumination level. DTIC

N94-17535# Walter Reed Army Inst. of Research, Washington, DC.
THE BEHAVIORAL TOXICOLOGY OF HIGH-PEAK, LOW AVERAGE POWER, PULSED MICROWAVE IRRADIATION Interim Report, 20 Oct. 1989 - 31 Dec. 1992
T. G. RASLEAR, Y. AKYEL, F. BATES, S.-T. LU, and E. C. ELSON 25 Jan. 1993 95 p
(AD-A268392) Avail: CASI HC A05/MF A01

The TEMPO microwave bioeffects exposure platform at the Department of Microwave Research, Walter Reed Army Institute of Research, produces an 80 ns, 3 GHz microwave pulse with a peak power of 700 MW. The energy transmitted is approximately 16 J, so that at a pulse repetition rate of 0.125 Hz, the duty factor is 10(exp -8) and the average power is 2 W. The time-averaged SAR for TEMPO exposures at full power is 0.072 W/kg, a value well-below suggested exposure limits. Five behavioral tasks were used to determine if exposure affected subsequent task performance: temporal bisection, Y-maze, treadmill running, food motivation (behavioral economics), and Persolt swim test. Reliable effects were found with the temporal bisection, Y-maze, treadmill, and behavioral economics tasks. The pattern of results suggests at least two effects of high-power pulsed microwaves: memory impairment and decreased physical endurance. It was suggested that research be expanded in this area, and that tasks which are specifically sensitive to memory function and physical endurance receive especial attention. DTIC

N94-17576# Intelligent Reasoning Systems, Inc., Las Cruces, NM.
A HIGH-SPEED OBJECT RECOGNITION CHIP BASED ON A BIOLOGICALLY-REALISTIC HYBRID TEMPORAL PROCESSING Progress Report No. 2
4 Aug. 1993 78 p
(Contract N00014-93-C-0118)
(AD-A268270) Avail: CASI HC A05/MF A01

This report traces the progress made by Intelligent Reasoning System, Inc. (IRSI) on contract N00014-93-C-0118, from June 1, 1993 to July 31, 1993. The technical objective of this Phase 1 effort is to evaluate the feasibility of a binocular object recognition system for the Integrated Active VISION System (INAVISIONS) currently under development at IRSI. The INAVISIONS is based on a custom Very Large Scale Integration (VLSI) Hybrid Temporal Processing Element (HTPE) developed by IRSI (patent pending). Active vision implies that the image collection and processing operations form a single, integrated, adaptive system in which high-level processes, such as object recognition can augment lower level processes through feedback connections and can itself be controlled by higher levels. For example, the object recognition process can instruct the oscillating saccadic perception system to enhance the image resolution by a particular amount to assist in the object recognition process. Higher level perception systems can guide the object recognition processes by using expectations of what objects might be present in the image. Therefore, the INAVISIONS behaves a single image collection and processing system with coupled low- and high-level capabilities. DTIC

N94-17967 Institute for Perception RVO-TNO, Soesterberg (Netherlands). Skilled Behavior Group.
A METHOD FOR COGNITIVE TASK ANALYSIS Final Report
A. M. SCHAAFSTAL and J. M. C. SCHRAAGEN 24 Jul. 1992 39 p Sponsored by TNO Defence Research, Delft, Netherlands
(IZF-1992-B5; TD92-2278; ETN-93-94527) Copyright Avail: TNO Institute for Perception, Kampweg 5, 3769 ZG Soesterberg, Netherlands

A method for cognitive task analysis based on the notion of 'generic tasks' is described. The method distinguishes three layers of analysis. At the first layer, the task structure, top level goals of a certain task that have to be fulfilled during task execution are identified. The task structure may also be viewed as the global strategy to carry out the task. At the second layer of analysis, the local strategies (procedures) are identified by means of which values are obtained for goals in the task structure. The third layer of analysis consists of a description of the underlying domain knowledge. The potentialities of the task model in predicting and diagnosing human cognitive behavior are discussed, and implications of the model for applied areas such as the development of knowledge based systems and training, are considered. ESA

N94-18121# Amsterdam Univ. (Netherlands).
LOCALIZATION OF FIGURE BACKGROUND SEGREGATION MECHANISMS IN PRIMATE VISUAL CORTEX Ph.D. Thesis
V. A. F. LAMME 20 Oct. 1992 182 p
(PB93-187961) Avail: CASI HC A09/MF A02

Contents of the document include the following: an introduction to anatomical organization of primary visual cortex, orientation selectivity, direction selectivity, and image segmentation; rationale and methods; equivalent dipole localization of texture segregation mechanisms in man and monkey; intracortical organization of texture segregation processing; and intracortical organization of motion defined image segmentation processing. NTIS

N94-18292# Johns Hopkins Univ., Baltimore, MD. Dept. of Psychology.
STOCHASTIC MODELS OF ATTENTION AND SEARCH Annual Report, 1 Mar. 1992 - 28 Feb. 1993
STEVEN YANTIS 28 Feb. 1993 15 p
(Contract F49620-92-J-0186)
(AD-A268622; AFOSR-93-0629TR) Avail: CASI HC A03/MF A01

Four lines of experimentation have been carried out. In the first set of experiments, we have tested and rejected a two-process model of visual attention allocation. The PI has proposed an alternative perceptual sampling model and performed stochastic simulations of the model to show that it can account for certain aspects of human performance in cued visual search tasks. In the second and third set of experiments, the PI has found that a common mechanism may underlie the perception of bistable apparent motion and the capture of visual attention in certain visual search tasks. In particular, the appearance of a new perceptual object in the visual field captures attention and this may influence how object identity is assigned in apparent motion perception. In the final set of experiments, the PI has examined the possible influence of factors influencing figural identity on the perception of bistable apparent motion. Preliminary results suggest that grouping by spatial proximity can modulate the assignment of motion correspondence in apparent motion perception. DTIC

N94-18304 California Univ., Los Angeles.
CORTICAL SUBSTRATE OF HAPTIC REPRESENTATION Final Report
24 Aug. 1993 9 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-J-1805)
(AD-A269583) Avail: CASI HC A02

The focus of the research has been on the role and mechanisms of memory in motor control. Based on experience and data from primates, computational models of short-term active memory have been developed. Such models may have technological interest and applications because this kind of memory is an essential feature of any motor control system, biological or mechanical. It appears that the neurally based and neurally testable modeling of the function of memory networks is unique among ONR-sponsored programs. Laboratory research led to the discovery of memory cells in the cerebral cortex of the monkey. Over a period of several years, extensive studies of neuronal activity and reversible cryogenic inactivation in monkeys performing memory tasks have provided theoretical framework of perceptual memory. Within that framework, memory cells are the constituents of widely distributed cortical networks which, by mechanisms yet unknown, are activated above certain thresholds and kept active, for seconds or minutes, to retain information for prospective motor action.
DTIC

N94-18313 Minnesota Univ., Minneapolis. Dept. of Psychology.
PSYCHOPHYSICAL ANALYSES OF PERCEPTUAL REPRESENTATIONS Annual Report, 15 Apr. 1992 - 14 Apr. 1993
IRVING BIEDERMAN 16 Jul. 1993 12 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0274-90)
(AD-A268711; AFOSR-93-0626TR) Avail: issuing Activity
(Defense Technical Information Center (DTIC))

Research during the year has been divided between studies at USC (Biederman and students) and Minnesota. Our research continues to focus on linking early sensory representations to higher-level perceptual representations. For this reason, we refer to our Center informally as the 'Middle Kingdom'. Studies outlined below have examined the sensory/perceptual 'middle ground' in object recognition, depth perception, reading acuity, and auditory perception. Several of our studies have used ideal-observer analysis. The ideal-observer approach provides a means for quantifying the information available to perception and for evaluating the effectiveness with which humans use that information.
DTIC

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A94-10086
CASHE LIGHTENS THE DATA LOAD
ALAN S. BROWN Aerospace America (ISSN 0740-722X) vol. 31, no. 9 Sept. 1993 p. 36, 37.
Copyright

Computer-Aided Systems Human Engineering, CASHE, containing all the data in the compendium and the Department of Defense's 1989 human engineering specifications, MIL-STD-1472D, is described. CASHE is capable of hyperlinking the two documents to cover more than 70 areas of human performance. It will come on a CD-ROM for Macintosh II computers equipped with at least 13-in. monitor.
AIAA

A94-10512
F-16 PILOT EXPERIENCE WITH COMBAT EJECTIONS DURING THE PERSIAN GULF WAR
CHRISTOPHER S. WILLIAMS (USAF, San Antonio, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 9 Sept. 1993 p. 845-847. refs
Copyright

Results of a questionnaire for four F-16 pilots regarding their experience with combat ejections during the Persian Gulf War are presented. Questions included recalling the parameters of egress to conscious recollections of the event and assessment of how well the system worked. Each of the four ejections occurred under different parameters, and no one suffered significant injury. This was one of the first times that experience was obtained with the F-16's ACES-II egress system under combat conditions and, in the experience of the pilots, the system was life-saving in combat. The overall ejection survival rate for the U.S. Air Force fighter/attack combat ejections during Operation Desert Storm was similar to the peacetime rate. It is argued that the reason for this may be due to a quicker, more predetermined decision to eject from an aircraft disabled by combat fire.
AIAA

A94-10715*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
DEVELOPMENT AND VERIFICATION TESTING OF AUTOMATION AND ROBOTICS FOR ASSEMBLY OF SPACE STRUCTURES
MARVIN D. RHODES, RALPH W. WILL (NASA, Langley Research Center, Hampton, VA), and CUONG C. QUACH (Lockheed Engineering & Sciences Co., Langley Programs Office, Hampton, VA) Sep. 1993 17 p. AIAA, Space Programs and Technologies Conference and Exhibit, Huntsville, AL, Sept. 21-23, 1993 refs
(AIAA PAPER 93-4076) Copyright

A program was initiated within the past several years to develop operational procedures for automated assembly of truss structures suitable for large-aperture antennas. The assembly operations require the use of a robotic manipulator and are based on the principle of supervised autonomy to minimize crew resources. A hardware testbed was established to support development and evaluation testing. A brute-force automation approach was used to develop the baseline assembly hardware and software techniques. As the system matured and an operation was proven, upgrades were incorprated and assessed against the baseline test results. This paper summarizes the developmental phases of the program, the results of several assembly tests, the current status, and a series of proposed developments for additional hardware and software control capability. No problems that would preclude automated in-space assembly of truss structures have been encountered. The current system was developed at a breadboard level and continued development at an enhanced level is warranted.

A94-10716*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NEUTRAL BUOYANCY EVALUATION OF EXTRAVEHICULAR ACTIVITY ASSEMBLY OF A LARGE PRECISION REFLECTOR
WALTER L. HEARD, JR. and MARK S. LAKE (NASA, Langley Research Center, Hampton, VA) Sep. 1993 10 p. AIAA, Space Programs and Technologies Conference and Exhibit, Huntsville, AL, Sept. 21-23, 1993 refs
(AIAA PAPER 93-4118) Copyright

A procedure that enables astronauts in extravehicular activity (EVA) to perform efficient on-orbit assembly of large paraboloidal precision reflectors is presented. The procedure and associated hardware are verified in simulated Og ° (neutral buoyancy) assembly tests of a 14m-diameter precision reflector mockup. The test article represents a precision reflector having a reflective surface which is segmented into 37 individual panels. The panels are supported on a doubly curved tetrahedral truss consisting of 315 struts. The entire truss and seven reflector panels were assembled in three hours and seven minutes by two pressure-suited test subjects. The average time to attach a panel was two minutes and three

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seconds. These efficient assembly times were achieved because all hardware and assembly procedures were designed to be compatible with EVA assembly capabilities.

A94-11151
POSTURE MODELING FOR A TRIAL OF A COLUMBUS RACK FRONT WORKPLACE
NICHOLAS A. T. COLFORD, GIORGIO MUSSO, PIER L. GIORGI, and ENRICO GAIA (Alenia Spazio S.p.A., Turin, Italy) Oct. 1993 5 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-155) Copyright

A computer based anthropometric mannequin for a simple task analysis of part of the operations foreseen at the principal workstation of the European attached pressurized module of the SSF is presented. The model intended to analyze IVA and EVA dynamic anthropometry is based on CAD and the ROSCAD robotic simulation system. The anthropometric models encompass robotic functions of rendering, collision detection, robotic motion, and problem solving. AIAA

A94-11154
CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM - THE FUTURE OF ASTRONAUTICS
M. A. LEVINSKIKH, G. I. MELESHKO, V. N. SYCHOV, and E. YA. SHEPELEV (Inst. for Biomedical Problems, Moscow, Russia) Oct. 1993 5 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993
(IAF PAPER 93-158) Copyright

The status of research on closed ecological life support systems is briefly surveyed. Attention is given to the creation of ground-based biological life support system (BLSS) models, including the vital activities of unicellular algae, higher plants, and microorganisms, as well as some physical and chemical processes. The degree of matter regeneration in two BLSS models - 'man-algae' and 'man-algae-high plants-mineralization' is illustrated, and a functional scheme of the 'man-chlorella-mineralization' model is given. AIAA

A94-11155
HARDWARE DESIGN AND TEST RESULTS OF THE THIRD VERSION OF THE C.E.B.A.S.-MINI MODULE - EXPERIMENTS WITH AN AQUATIC MAN-MADE ECOSYSTEM
V. BLUEM (Bochum, Ruhr-Univ., Germany), K. KREUZBERG (DLR, Cologne, Germany), and E. STRETZKE (Bochum, Ruhr-Univ. Germany) Oct. 1993 10 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by BMFT, DARA, and Ministry of Science and Research of Nordrhein-Westfalen refs
(IAF PAPER 93-159) Copyright

Experiments based on the Closed Equilibrated Biological Aquatic System (C.E.B.A.S.) MINI MODULE are described. Emphasis is placed on the role of the MINI MODULE in the C.E.B.A.S. project and its function as a spaceflight hardware test in the space test phase for the development of the space station version. Test results show that the system maintains biological stability for more than 50 days and is suitable for biosatellite flights or a mid-term test in the MIR space station. The C.E.B.A.S. is a partially closed artificial or man-made aquatic ecosystem which may be optimized and serve as a valuable tool in biospherics research. AIAA

A94-11156
INVESTIGATION OF BIOLOGICAL COMPONENTS OF AN AQUATIC MICROCOSM UNDER THE EFFECT OF A SPACEFLIGHT
M. A. LEVINSKIKH, V. N. SYCHOV, and G. I. MELESHKO (Inst. for Biomedical Problems, Moscow, Russia) Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-160) Copyright

The paper examines the influence of spaceflight conditions of an ecosystem where all the levels of biological organization were represented, from a single organism in the phases of orthogenesis to a population, biocoenosis, and ecosystem level. An ecosystem model based on the structure of a fresh-water pond is used as a research method. A substantial decrease of the chlorophyll content in the cells was found. There was a definite prevalence of bacteria of the amylolytic group. There were no cellulose bacteria, spore bacteria, actinomycetes, yeast, micelial fungi, and enterobacteria. The number of bacteria of the ammonificator group remained unchanged. It is argued that the change in the number of bacteria of different groups in the microcosm may be due to the changes in the qualitative composition of soluble organic matter in the environment. AIAA

A94-11157
THE PROBLEMS OF MICROBIAL SAFETY IN REGENERATIVE LIFE SUPPORT SYSTEMS EXPLORATION
A. N. VIKTOROV, V. K. IL'IN, and YU. E. SINYAK (Inst. for Biomedical Problems, Moscow, Russia) Oct. 1993 9 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-161) Copyright

The paper outlines a conceptual approach to the problem of assuring microbial safety in regenerative life support systems, based on long-term experience with ground and flight tests and orbital missions. Some practical recommendations on microbial safety are worked out, with particular reference to the planned mission to Mars. AIAA

A94-11158
THE EMSI SIMULATION CAMPAIGNS - MICROBIAL CONTAMINATION OF THE CLOSED, MANNED HABITATS
MARIA STRANGER-JOHANNESEN, ROALD SOERHEIM (Foundation for Scientific and Industrial Research, Oslo, Norway), DANIELE ZANOTTI (ESTEC, Noordwijk, Netherlands), and ALESSANDRO BICHI (ESA, Paris, France) Oct. 1993 6 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-162) Copyright

Investigations of microbiological contamination in totally closed, manned habitats were performed in three Long Duration Manned Space Simulation Experiments, sponsored by ESA. The experiments were carried out in diverse chambers in France, Norway, and Germany, and provided a unique opportunity to study the development of microbial contamination in the environment, and fluctuation of microbial colony forming units (cfu) in the air, during confinement of a crew of 3-6 people for 74, 28 and 61 days. The results obtained confirmed known facts and hypotheses, that the build-up of microbial populations in an environment will depend on prevailing humidity for growth and on the human performance with respect to contamination control. Before the experiments, the cleaned and disinfected chambers were microbiologically clean. During isolation the bacteria in the air were mainly of human origin and varied between 200 and 3000 cfu/cu m. After the experiments, similar human bacteria were found in dry places of the habitats, while large populations of fungi and other bacterial species had developed in humid and wet areas.
Author (revised)

A94-11159* National Aeronautics and Space Administration, Washington, DC.
MATERIAL SELECTION FOR HIGHLY MOBILE SPACE SUIT GLOVES BASED ON FABRIC MECHANICAL PROPERTIES
JOHN A. MAIN, STEVEN W. PETERSON, and ALVIN M. STRAUSS (Vanderbilt Univ., Nashville, TN) Oct. 1993 9 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by NASA refs
(IAF PAPER 93-165) Copyright

This paper discusses the factors that control the flexibility of fabric space suit elements by examining a bending model of a pressurized fabric tube. Results from the model are used to evaluate the current direction in highly mobile EVA glove research and suggest that changes are necessary in the glove fabric selection methodology.

A94-11162
EXPERIENCE FROM ACTIVE DOSIMETRIC INVESTIGATIONS ON MIR-SPACE STATION - PROPOSAL FOR A NEW CONCEPTION AND DESIGN OF SPACE DOSIMETRY SYSTEMS FOR FUTURE MANNED MISSIONS
J. V. SEMKOVA, TS. P. DACHEV, YU. N. MATVIJCHUK, B. T. TOMOV, R. T. KOLEVA, P. T. BAJNOV, N. G. KANCHEV (Bulgarian Academy of Sciences, Solar-Terrestrial Influences Lab., Sofia, Bulgaria), V. M. PETROV, V. A. SHURSHAKOV, V. V. BENGIN (Inst. for Biomedical Problems, Moscow, Russia) et al. Oct. 1993 7 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-171) Copyright

Since 1988, using the Bulgarian-Russian semiconductor dosimetry-radiometry system Liulin and the French tissue-equivalent system CIRCE, active dosimetric investigations have been performed on board the Mir space station. Investigations during quiet solar conditions and during solar proton events are presented. The main results can be summarized as follows: The mean dose behind 5 g/sq cm at an altitude of about 400 km and inclination of 51.6 deg was determined by the semiconductor detector for quiet solar conditions to be about 0.3 mGy/day. High linear energy transfer events produced by ions with q values in the 10-20 range significantly contribute to the total dose outside the South Atlantic anomaly. The mean flux of such events in March-April 1989 is 14/sq cm per day. The variations of flux and dose rate in different compartments of the station are more than 200 percent because of different shielding. For the era of large orbital stations, lunar bases and interplanetary space ships, a new conception and design of on board dosimetry systems is proposed. Author (revised)

A94-11170
REAL TIME SIMULATION OF MULTI-BODY DYNAMICS - APPLICATION TO THE SPACE STATION FREEDOM MOBILE SERVICING SYSTEM
D. CRABTREE (Canadian Space Agency, Saint-Hubert, Canada), K. BUHARIWALA (Spar Aerospace, Ltd., Brampton, Canada), G. D'ELEUTERIO (Toronto Univ., Downsview, Canada), and P. SCOTT (Canadian Space Agency, Saint-Hubert, Canada) Oct. 1993 11 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-213) Copyright

As the complexity of robotics systems increases, so do the computational resources required for simulation. The complexity of the Mobile Servicing System (MSS) configuration requires real-time (RT) simulation of elastic multibody dynamics that often exceed computational resources. This situation is compounded by a partial allocation of key resources to simulate other effects necessary to achieve adequate fidelity. RT dynamic simulation has been achieved for topological chain configurations of the MSS. Tree, closed loop, and transient topologies (including force-moment accommodation, contact dynamics, and increased degrees of freedom and modeling detail) nevertheless require additional capacity for MSS simulation. By defining the minimum acceptable fidelity for simulated systems, various levels of approximation have been applied in a solution procedure best adapted for serial processing. Resulting simulation benchmarks have been obtained for both serial and parallel hardware architectures.
Author (revised)

A94-11187* National Aeronautics and Space Administration, Washington, DC.
DESIGN AND CONTROL OF A HAND EXOSKELETON FOR USE IN EXTRAVEHICULAR ACTIVITIES
B. SHIELDS, S. PETERSON, A. STRAUSS, and J. MAIN (Vanderbilt Univ., Nashville, TN) Oct. 1993 10 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 Research supported by NASA refs
(IAF PAPER 93-252) Copyright

To counter problems inherent in extravehicular activities (EVA) and complex space operations, an exoskeleton, a unique adaptive structure, has been designed. The exoskeleton fits on the hand and powers the proximal and middle phalanges of the index finger, the middle finger, and the combined ring and little finger. A kinematic analysis of the exoskeleton joints was performed using the loop-closure method. This analysis determined the angular displacement and velocity relationships of the exoskeleton joints. This information was used to determine the output power of the exoskeleton. Three small DC motors (one for each finger) are used to power the exoskeleton. The motors are mounted on the forearm. Power is transferred to the exoskeleton using lead screws. The control system for the exoskeleton measures the contact force between the operator and the exoskeleton. This information is used as the input to drive the actuation system. The control system allows the motor to rotate in both directions so that the operator may close or open the exoskeleton.

A94-11264* National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.
EXTRAVEHICULAR ACTIVITY TRAINING AND HARDWARE DESIGN CONSIDERATIONS
PIERRE J. THUOT and GREGORY J. HARBAUGH (NASA, Jonhson Space Center, Houston, TX) Oct. 1993 13 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-517)

Designing hardware that can be successfully operated by EVA astronauts for EVA tasks required to assemble and maintain Space Station Freedom requires a thorough understanding of human factors and of the capabilities and limitations of the space-suited astronaut, as well as of the effect of microgravity environment on the crew member's capabilities and on the overhead associated with EVA. This paper describes various training methods and facilities that are being designed for training EVA astronauts for Space Station assembly and maintenance, taking into account the above discussed factors. Particular attention is given to the user-friendly hardware design for EVA and to recent EVA flight experience. AIAA

A94-11270* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.
THE IMPLEMENTATION OF THE HUMAN EXPLORATION DEMONSTRATION PROJECT (HEDP), A SYSTEMS TECHNOLOGY TESTBED
ROBERT ROSEN and DAVID J. KORSMEYER (NASA, Ames Research Center, Moffett Field, CA) Oct. 1993 9 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-538)

The Human Exploration Demonstration Project (HEDP) is an ongoing task at the NASA's Ames Research Center to address the advanced technology requirements necessary to implement an integrated working and living environment for a planetary surface habitat. The integrated environment consists of life support systems, physiological monitoring of project crew, a virtual environment work station, and centralized data acquisition and habitat systems health monitoring. The HEDP is an integrated technology demonstrator, as well as an initial operational testbed. There are several robotic systems operational in a simulated planetary landscape external to the habitat environment, to provide representative work loads for the crew. This paper describes the evolution of the HEDP from initial concept to operational project; the status of the HEDP after two years; the final facilities composing the HEDP; the project's role as a NASA Ames Research Center systems technology testbed; and the interim demonstration scenarios that have been run to feature the developing technologies in 1993. Author (revised)

A94-11282
VIRTUAL ENVIRONMENT TECHNOLOGY FOR SPACE APPLICATIONS
G. J. JENSE (TNO, The Hague, Netherlands) Oct. 1993 11 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-589) Copyright

The paper discusses the applicability of the virtual environment

(VE) technology for space-related applications. After giving a working definition of a virtual environment, the structure of virtual environment is described, and a VE classification scheme is presented. A number of potential space applications are discussed together with the recently developed prototype applications. The relevant VE technologies are examined in detail, including display technology, tracking systems, three-dimensional sound, tactile/force feedback, integrated VE simulation environments, image generation, and collision detection and modeling. The current limitations of VE technologies are discussed. AIAA

A94-11283
SENSORBASED SPACE ROBOTICS - ROTEX AND ITS TELEROBOTIC FEATURES
G. HIRZINGER, K. LANDZETTEL, and J. DIETRICH (DLR, Oberpfaffenhofen, Germany) Oct. 1993 21 p. IAF, International Astronautical Congress, 44th, Graz, Austria, Oct. 16-22, 1993 refs
(IAF PAPER 93-591) Copyright

In early 1993, the space robot technology experiment ROTEX has flown with Space Shuttle COLUMBIA (Spacelab mission D2 on flight STS-55 from April 26 to May 6). A multisensory robot on board the spacecraft successfully worked in autonomous modes, teleoperated by astronauts, as well as in different telerobotic ground-control modes. These include on-line teleoperation and telesensor programming, a task-level oriented programming technique involving 'learning by showing' concepts in a virtual environment. The robot's key features are its multisensory gripper and the local sensory feedback schemes, which are the basis for shared autonomy. The corresponding man-machine interface concepts using a 6 DOF nonforce-reflecting control ball and visual feedback to the human operator are explained. Stereographic simulation on-ground was used to predict the robot's free motion and the sensor-based path refinement on board; prototype tasks performed by this space robot were the assembly of a truss structure, connecting/disconnecting an electrical plug (orbit replaceable unit exchange), and grasping free-floating objects.
Author (revised)

A94-11367
SIMULATION AND THE INVESTIGATION OF AIRCREW ERROR
J. W. CHAPPELOW (RAF, Inst. of Aviation Medicine, Farnborough, United Kingdom) *In* The use of simulation in aircraft accident prevention and investigation; Proceedings of the Conference, London, United Kingdom, Nov. 11, 12, 1992 London Royal Aeronautical Society 1992 p. 12.1-12.6. refs
Copyright

Human factors investigations necessarily address less concrete issues than technical investigations, and often produce results couched in probabilistic rather than deterministic terms. Simulation techniques can assist human factors investigations, but cannot modify these inherent characteristics. They offer the possibility of enhancing confidence in hypotheses rather than categorical proof, and, as such, need to be used with caution. Visual cues and crew response times seem to provide relatively straight forward avenues for investigation using simulation techniques. Examples are given.

A94-11435#
SYNERGISTIC COMPUTING APPLIED TO A VIRTUAL-PIVOT SIX-DEGREE-OF-FREEDOM HAND CONTROLLER DESIGNED FOR AEROSPACE TELEROBOTICS
WILLIAM C. MARSHALL, ROBERT E. DEMERS, BRIAN W. SCHIPPER, and LEE LEVITAN (Honeywell, Inc., Minneapolis, MN) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 1 Washington American Institute of Aeronautics and Astronautics 1993 p. 276-285. refs
(AIAA PAPER 93-4506) Copyright

We have designed and constructed a new six-degree-of-freedom hand controller testbed incorporating Honeywell's patented virtual-pivot concept. Unlike a passive controller, which uses springs, the virtual-pivot hand controller (VPHC) is an active device that uses motors to control platform displacements and to provide the sensed virtual-pivot feel. The high-speed real-time control microprocessor provides an estimated 10-Hz system bandwidth while using force/torque sensor, shaft angle, and tachometer measurements with rate-feedback motor controllers to generate the feel of pivot location, springs, soft stops, and deadbands found in more conventional designs. In effect, the virtual-pivot feel is a form of enhanced virtual reality to the operator's tactile senses. Past human factors research has shown that the virtual-pivot concept results in lower operator fatigue, reduces cross-coupling effects, minimizes training time, and permits one mechanism to fit different hand sizes without hardware changes. The development of the testbed is described together with its kinematic equations, control theory, and current testbed status.

A94-11526*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOWARD AN EMBEDDED TRAINING TOOL FOR DEEP SPACE NETWORK OPERATIONS
RANDALL W. HILL, JR., KATHRYN F. STURDEVANT (JPL, Pasadena, CA), and W. L. JOHNSON (Southern California Univ., Marina del Rey, CA) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1056-1065. Research supported by DARPA refs
(Contract N0001[illegible]-92-K-2015)
(AIAA PAPER 93-4656) Copyright

There are three issues to consider when building an embedded training system for a task domain involving the operation of complex equipment: (1) how skill is acquired in the task domain; (2) how the training system should be designed to assist in the acquisition of the skill, and more specifically, how an intelligent tutor could aid in learning; and (3) whether it is feasible to incorporate the resulting training system into the operational environment. This paper describes how these issues have been addressed in a prototype training system that was developed for operations in NASA's Deep Space Network (DSN). The first two issues were addressed by building an executable cognitive model of problem solving and skill acquisition of the task domain and then using the model to design an intelligent tutor. The cognitive model was developed in Soar for the DSN's Link Monitor and Control (LMC) system; it led to several insights about learning in the task domain that were used to design an intelligent tutor called REACT that implements a method called 'impasse-driven tutoring'. REACT is one component of the LMC training system, which also includes a communications link simulator and a graphical user interface. A pilot study of the LMC training system indicates that REACT shows promise as an effective way for helping operators to quickly acquire expert skills.
Author (revised)

A94-11527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DESIGN AND IMPLEMENTATION OF A STATUS AT A GLANCE USER INTERFACE FOR A POWER DISTRIBUTION EXPERT SYSTEM
EUGENE M. LIBERMAN, DAVID B. MANNER (Sverdrup Technology, Inc., Brook Park, OH), JAMES L. DOLCE, and PAMELA A. MELLOR (NASA, Lewis Research Center, Cleveland, OH) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1066-1070. refs
(AIAA PAPER 93-4657) Copyright

A user interface to the power distribution expert system for Space Station Freedom is discussed. The importance of features which simplify assessing system status and which minimize navigating through layers of information are examined. Design rationale and implementation choices are also presented. The amalgamation of such design features as message linking arrows, reduced information content screens, high salience anomaly icons, and color choices with failure detection and diagnostic explanation

from an expert system is shown to provide an effective status-at-a-glance monitoring system for power distribution. This user interface design offers diagnostic reasoning without compromising the monitoring of current events. The display can convey complex concepts in terms that are clear to its users.
AIAA

A94-11529*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE NETWORK (DSN), NETWORK OPERATIONS CONTROL CENTER (NOCC) COMPUTER-HUMAN INTERFACES
ALVIN ELLMAN and MAGDI CARLTON (JPL, Pasadena, CA) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1075-1078.
(AIAA PAPER 93-4659) Copyright

The technical challenges, engineering solutions, and results of the NOCC computer-human interface design are presented. The use-centered design process was as follows: determine the design criteria for user concerns; assess the impact of design decisions on the users; and determine the technical aspects of the implementation (tools, platforms, etc.). The NOCC hardware architecture is illustrated. A graphical model of the DSN that represented the hierarchical structure of the data was constructed. The DSN spacecraft summary display is shown. Navigation from top to bottom is accomplished by clicking the appropriate button for the element about which the user desires more detail. The telemetry summary display and the antenna color decision table are also shown.
AIAA

A94-11530*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AN ARCHITECTURE AND MODEL FOR COGNITIVE ENGINEERING SIMULATION ANALYSIS - APPLICATION TO ADVANCED AVIATION AUTOMATION
KEVIN M. CORKER (NASA, Ames Research Center, Moffett Field, CA) and BARRY R. SMITH (U.S. Army, Aeroflightdynamics Directorate, Moffett Field, CA) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1079-1088. Research supported by U.S. Army refs
(AIAA PAPER 93-4660) Copyright

The process of designing crew stations for large-scale, complex automated systems is made difficult because of the flexibility of roles that the crew can assume, and by the rapid rate at which system designs become fixed. Modern cockpit automation frequently involves multiple layers of control and display technology in which human operators must exercise equipment in augmented, supervisory, and fully automated control modes. In this context, we maintain that effective human-centered design is dependent on adequate models of human/system performance in which representations of the equipment, the human operator(s), and the mission tasks are available to designers for manipulation and modification. The joint Army-NASA Aircrew/Aircraft Integration (A3I) Program, with its attendant Man-machine Integration Design and Analysis System (MIDAS), was initiated to meet this challenge. MIDAS provides designers with a test bed for analyzing human-system integration in an environment in which both cognitive human function and 'intelligent' machine function are described in similar terms. This distributed object-oriented simulation system, its architecture and assumptions, and our experiences from its application in advanced aviation crew stations are described.
Author (revised)

A94-11542*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
DESIGN FOR AN INTEGRATED DISCIPLINE OPERATIONS CONTROL CENTER FOR SPACE STATION FREEDOM
RICHARD F. HAINES (Recom Technologies, Inc.; NASA, Ames Research Center, Moffett Field, CA) *In* AIAA Computing in Aerospace Conference, 9th, San Diego, CA, Oct. 19-21, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1200-1207. refs
(AIAA PAPER 93-4679) Copyright

This paper presents selected features of a human factors oriented plan for a Space Station Freedom (SSF) ground Discipline Operations Center (DOC) that is integrated with other work areas used by multidisciplinary life scientists. This combined facility is referred to as an integrated DOC or IDOC. This plan is based upon the assumption that there will be a constantly changing array of specialized equipment and procedures used by life sciences principal investigators (PI) on the ground which must be linked to SSF through various DOC systems. Other sites will also be able to communicate with SSF (Anon., 1992). It is also assumed that cost reduction will be a major design consideration and that one integrated structure will be less expensive to build and operate than two separate ones. Since both the DOC personnel and PIs will need to communicate with the flight crew aboard SSF, the general interconnect architecture of the PIs' communication linkage is considered here. Key human factor design elements of this plan include: a candidate facility layout which accommodates three (3), multipurpose, rapidly reconfigurable work areas (suites) and consequent user traffic flow considerations, a multimedia telecommunications support capability, functional (human) traffic flow, optimized internal illumination and acoustics requirements, selected volumetric and safety requirements, and other architectural design parameters.

A94-11706
ENHANCED SITUATION AWARENESS TECHNOLOGY FOR RETROFIT AND ADVANCED COCKPIT DESIGN; PROCEEDINGS OF THE SAE AEROTECH '92 CONFERENCE, ANAHEIM, CA, OCT. 5-8, 1992
Warrendale, PA Society of Automotive Engineers, Inc. (SAE SP-933) 1992 199 p. For individual items see A94-11707 to A94-11724
(SAE SP-933; ISBN 1-56091-294-4) Copyright

Various papers on enhanced situation awareness technology for retrofit and advanced cockpit design are presented. Individual topics addressed include: analysis of crew time optimization for essential maintenance activities, integration of charting into the glass cockpit, repeated measures of mental performances on transoceanic flight crews, real-world experience in fitness-of-duty testing, MMW technology for enhanced situation awareness/enhanced vision systems, situation versus command guidance symbology for hybrid landing systems applications, human factors research and implications of enhanced/synthetic vision systems, piloted studies of enhanced or synthetic vision display parameters. Also discussed are: synthetic vision system technology demonstration methodology, enhanced/synthetic vision systems for commercial transports, airline perspective on data link, conceptual flight deck system data link, certification of airborne data link equipment, human factors issues of data link, effect of automation in pilot situational awareness in the data link ATC environment, cockpit data link displays, data link system development at the FAA Technical Center, controller evaluations of ATC data link services.
AIAA

A94-11707
ANALYSIS OF CREW TIME OPTIMIZATION FOR EXTERNAL MAINTENANCE ACTIVITIES
CAROLYN OVERMYER (McDonnell Douglas Space Systems Co., Huntington Beach, CA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 1-3.
(SAE PAPER 921901) Copyright

The task scripting required to produce a frame-by-frame graphic simulation of EVA activity using timelines created for an end-to-end maintenance activity is discussed. Crew time design and operations issues identified by the simulation are addressed, including handrails on the airlock, the Crew and Equipment Translation Aides cart, Mobile Base System, truss structure, and the Unpressurized

Logistics Carrier. Translation with an orbital replacement unit and the location of the EVA Support Equipment and Tool Box are also identified as issues. AIAA

A94-11708
INTEGRATION OF CHARTING INTO THE GLASS COCKPIT
THOMAS O. YOUNG (Air Line Pilots Association, Washington) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 5-7. refs
(SAE PAPER 921905) Copyright

Pilots of aircraft flown in instrument conditions, during periods of darkness, or restricted visibility are not provided with information that is essential to maintain the situational awareness required for the safe operation of their aircraft. The pilot's critical need for this information is neither widely perceived nor being quickly acted upon. This paper describes these information deficiencies and suggests methods of utilizing the pictorial display of electronic charting information, coupled with a precision navigation device such as the Global Positioning System (GPS), to satisfy this critical need.

A94-11712
SITUATION VS. COMMAND GUIDANCE SYMBOLOGY FOR HYBRID LANDING SYSTEMS APPLICATIONS
T. A. DEMOSTHENES (SAE, Warrendale, PA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 33-57.
(SAE PAPER 921967) Copyright

The Hybrid Landing System concept referred to in this paper, utilizes a holographic Head Up Display (HUD) as a precision monitor for a Fail Passive Autoland System. An industry group of researchers has evaluated two different concepts of HUD symbology that might be used to monitor an autoland system approach and landing. Set 1 utilized command guidance (flight director) symbology. Set 4 was designed for the purpose of providing situation information instead of command guidance.

A94-11713 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ENHANCED/SYNTHETIC VISION SYSTEMS - HUMAN FACTORS RESEARCH AND IMPLICATIONS FOR FUTURE SYSTEMS
DAVID C. FOYLE, ALBERT J. AHUMADA, JAMES LARIMER, and BARBARA T. SWEET (NASA, Ames Research Center, Moffett Field, CA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 59-66. refs
(Contract RTOP 505-64-36; RTOP 505-64-53)
(SAE PAPER 921968) Copyright

This paper reviews recent human factors research studies conducted in the Aerospace Human Factors Research Division at NASA Ames Research Center related to the development and usage of Enhanced or Synthetic Vision Systems. Research discussed includes studies of field of view (FOV), representational differences of infrared (IR) imagery, head-up display (HUD) symbology, HUD advanced concept designs, sensor fusion, and sensor/database fusion and evaluation. Implications for the design and usage of Enhanced or Synthetic Vision Systems are discussed.

A94-11714* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PILOTED STUDIES OF ENHANCED OR SYNTHETIC VISION DISPLAY PARAMETERS
RANDALL L. HARRIS, SR. and RUSSELL V. PARRISH (NASA, Langley Research Center, Hampton, VA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 67-76. refs
(SAE PAPER 921970) Copyright

This paper summarizes the results of several studies conducted at Langley Research Center over the past few years. The purposes of these studies were to investigate parameters of pictorial displays and imaging sensors that affect pilot approach and landing performance. Pictorial displays have demonstrated exceptional tracking performance and improved the pilots' spatial awareness. Stereopsis cueing improved pilot flight performance and reduced pilot stress. Sensor image parameters such as increased field-of-view, faster image update rate, and aiding symbology improved flare initiation. Finer image resolution and magnification improved attitude control performance parameters.

A94-11715
SYNTHETIC VISION SYSTEM TECHNOLOGY DEMONSTRATION METHODOLOGY AND RESULTS TO DATE
WALTER F. HORNE (Georgia Inst. of Technology, Atlanta), STANLEY EKIERT (Eastman Kodak Co., Rochester, NY), JEFF RADKE (Honeywell, Inc., Minneapolis, MN), RICHARD R. TUCKER (TRW, Inc., Cleveland, OH), C. H. HANNAN (Eastman Kodak Co., Rochester, NY), and J. A. ZAK (Hughes STX Corp., Lanham, MD) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 77-95.
(SAE PAPER 921971) Copyright

The present status of the Synthetic Vision System Technology Demonstration (SVSTD) project is discussed. The SVSTD is a multiagency/industry cooperative effort to develop, demonstrate, and document the performance of a visual-imaging aircraft system concept for providing safe aircraft landing, takeoff, and ground operations in very low visibility conditions. The sensor characteristics measured by the SVSTD are reviewed, and tower testing methodology and facilities for SVSTD are described. Sensor performance results to date in tower tests are reviewed. AIAA

A94-11716
SEEING THROUGH THE WEATHER - ENHANCED/SYNTHETIC VISION SYSTEMS FOR COMMERCIAL TRANSPORTS
JOHN R. TODD, ROBERT B. HESTER, and LEE G. SUMMERS (Douglas Aircraft Co., Long Beach, CA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 97-104.
(SAE PAPER 921973) Copyright

Commercial air carriers have long desired an aircraft system which would permit airport operations in very poor visibility conditions. Enhanced/synthetic vision systems, incorporating forward looking sensors and head-up displays, offer this ability. This paper discusses the potential benefits of enhanced/synthetic vision systems as well as their various levels of integration and associated capabilities possible. Work at Douglas Aircraft on enhanced/synthetic vision systems is also noted.

A94-11720* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EXPERIMENTAL STUDIES ON THE EFFECT OF AUTOMATION ON PILOT SITUATIONAL AWARENESS IN THE DATALINK ATC ENVIRONMENT
EDWARD C. HAHN and R. J. HANSMAN, JR. (MIT, Cambridge, MA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p. 129-140. Research supported by FAA refs
(Contract NAG2-716)
(SAE PAPER 922022) Copyright

An experiment to study how automation, when used in conjunction with datalink for the delivery of ATC clearance

amendments, affects the situational awareness of aircrews was conducted. The study was focused on the relationship of situational awareness to automated Flight Management System (FMS) programming of datalinked clearances and the readback of ATC clearances. Situational awareness was tested by issuing nominally unacceptable ATC clearances and measuring whether the error was detected by the subject pilots. The experiment also varied the mode of clearance delivery: Verbal, Textual, and Graphical. The error detection performance and pilot preference results indicate that the automated programming of the FMS may be superior to manual programming. It is believed that automated FMS programming may relieve some of the cognitive load, allowing pilots to concentrate on the strategic implications of a clearance amendment. Also, readback appears to have value, but the small sample size precludes a definite conclusion. Furthermore, because textual and graphical modes of delivery offer different but complementary advantages for cognitive processing, a combination of these modes of delivery may be advantageous in a datalink presentation.

A94-11721* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
IDENTIFICATION OF IMPORTANT 'PARTY LINE' INFORMATION ELEMENTS AND THE IMPLICATIONS FOR SITUATIONAL AWARENESS IN THE DATALINK ENVIRONMENT
ALAN H. MIDKIFF and R. J. HANSMAN, JR. (MIT, Cambridge, MA) *In* Enhanced situation awareness technology for retrofit and advanced cockpit design; Proceedings of the SAE Aerotech '92 Conference, Anaheim, CA, Oct. 5-8, 1992 Warrendale, PA Society of Automotive Engineers, Inc. 1992 p 141-154. Research supported by FAA refs
(Contract NAG2-716)
(SAE PAPER 922023) Copyright

A pilot opinion survey and a full-mission flight simulation experimental study of the use of party line information (PLI) in air/ground digital datalink communications are reported. PLI containing weather situation information was perceived by the pilots as the most important, followed by holding information. The top-scoring importance items were associated with aircraft arrival. Information regarding wind shear, holding EFC validity, and deviations for turbulence weather was assimilated most readily by pilots in the simulation. Assimilation was poorest during situations where the crew was absorbed in a task, such as setting takeoff power and considering diversion options while holding. AIAA

A94-11769 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE PRESENCE OF FIELD GEOLOGISTS IN MARS-LIKE TERRAIN
MICHAEL W. MCGREEVY (NASA, Ames Research Center, Moffett Field, CA) Presence: Teleoperators and Virtual Environments (ISSN 1054-7460) vol. 1, no. 4 Fall 1992 p. 375-403. refs
(Contract RTOP 326-72-20-01)
Copyright

Methods of ethnographic observation and analysis have been coupled with object-oriented analysis and design concepts to begin the development of a clear path from observations in the field to the design of virtual presence systems. The existence of redundancies in field geology and presence allowed for the application of methods for understanding complex systems. As a result of this study, some of these redundancies have been characterized. Those described are all classes of continuity relations, including the continuities of continuous existence, context-constituent continuities, and state-process continuities. The discussion of each includes statements of general relationships, logical consequences of these, and hypothetical situations in which the relationships would apply. These are meant to aid in the development of a theory of presence. The discussion also includes design considerations, providing guidance for the design of virtual planetary exploration systems and other virtual presence systems. Converging evidence regarding continuity in presence is found in the nature of psychological dissociation. Specific methodological refinements should enhance ecological validity in subsequent field studies, which are in progress.

N94-10296# Naval Air Warfare Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
MASS PROPERTIES TEST PROCEDURE FOR MANIKIN HEADFORMS AND HELMET SYSTEMS Final Report
JEFFREY M. THORNTON and DAVID J. ZABOROWSKI (KR Systems, Inc., Warminster, PA.) Oct. 1992 47 p
(AD-A265654; NAWCADWAR-92092-60) Avail: CASI HC A03/MF A01

The mathematical modeling and comparison of manikin headforms and helmet systems requires that the mass properties be accurately determined. The specific properties that must be known are the weight, center of gravity location, magnitudes of the principal moments of inertia and orientation of the principal axes. This data is compared to the specifications of a specific program and also provides insight into issues such as helmet comfort/fit, fatigue and head accelerations/neck forces during ejection or emergency landings. The Mass Properties (M.P.) System and associated software, provide a relatively simple method for measuring these mass properties. This document is intended for use by persons responsible for operating the M.P. System. Included in this report are theoretical calculations, a description of materials required, and step-by-step procedures for system set-up, calibration and determination of weight, center of gravity, and magnitude and orientation of the principal mass moments of inertia. DTIC

N94-10806# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
HEAD AND FACE ANTHROPOMETRY OF ADULT US CIVILIANS Final Report
JOSEPH W. YOUNG Jul. 1993 43 p
(DOT/FAA/AM-93/10) Avail: CASI HC A03/MF A01

A total of 17 traditional and 5 new head and facial dimensions from a random, composite U.S. female and male civilian population measured over a period of 30 years are presented. The 5 new measurements, identified to describe specific anatomical relationships of the face, can have a direct influence on equipment design concepts. The survey population includes 376 (195 females and 172 males) adult subjects in the age range of 17 through 69 years representing a predominantly high ratio of Caucasian subjects to other ethnic origin subjects. The data summary format is specifically intended for basic design concept use. These dimensions describe essential anatomical characteristics for use as basic design criteria in the development of protective equipment for the head and face. Because of the lack of standardization of anatomical and anthropometrical terminology, a thesaurus of selected anatomical and anthropometrical terms, specific to descriptive labels used, is provided as a cross reference for anthropometrical dimensions. Author (revised)

N94-11258*# Bionetics Corp., Cocoa Beach, FL.
STATISTICAL ANALYSIS OF ENVIRONMENTAL VARIABILITY WITHIN THE CELSS BREADBOARD PROJECT'S BIOMASS PRODUCTION CHAMBER
G. W. STUTTE, P. V. CHETIRKIN, C. L. MACKOWIAK, and R. E. FORTSON Feb. 1993 39 p
(Contract NAS10-11624)
(NASA-TM-109188; NAS 1.15:109188; REV-399) Avail: CASI HC A03/MF A01

Variability in the aerial and root environments of NASA's Breadboard Project's Biomass Production Chamber (BPC) was determined. Data from two lettuce and two potato growouts were utilized. One growout of each crop was conducted prior to separating the upper and lower chambers; the other was subsequent to separation. There were little or no differences in pH, EC, or solution temperature between the upper and lower chamber or within a chamber. Variation in the aerial environment within a chamber was two to three times greater than variation between chambers for air temperature, relative humidity, and PPF. High variability in air velocity, relative to tray position, was observed.

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Separating the BPC had no effect on PPF, air velocity, solution temperature, pH, or EC. Separation reduced the gradient in air temperature and relative humidity between the upper and lower chambers, but increased the variability within a chamber. Variation between upper and lower chambers was within 5 percent of environmental set-points and of little or no physiological significance. In contrast, the variability within a chamber limits the capability of the BPC to generate statistically reliable data from individual tray treatments at this time. Author (revised)

N94-11291# Army Aeromedical Research Lab., Fort Rucker, AL.

CORRELATION OF HGU-56/P AIRCREW HELMET FITTING WITH HEAD ANTHROPOMETRIC MEASUREMENTS Final Report

JAMES E. BRUCKART, KEVIN T. MASON, SAMUEL G. SHANNON, WILLIAM E. MCLEAN, and STEVEN P. PACQUETTE Feb. 1993 31 p

(Contract DA PROJ. 3M1-62787-A-879)

(AD-A264988; USAARL-93-14) Avail: CASI HC A03/MF A01

The U.S. Army is developing an Aircrew Integrated Helmet System to replace the current flight helmets. The HGU-56/P flight helmet is proposed in six sizes with a new fitting method based on a nonstandard measure of the aviator head length. Standard anthropometric head measurements and the Gentex Corporation fitting method for the HGU-56/P flight helmet are evaluated to determine the applicability of the fitting method and distribution of helmet sizes required to fit the U.S. Army aviator population. Two hundred forty-two volunteer aviators had standard anthropometric measurements of their heads. Each was fitted with an HGU-561P flight helmet in their recommended size) and a helmet one size larger and one size smaller than recommended. ANVIS compatibility with each helmet was tested for a subset of the subjects. DTIC

N94-11375*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

ALLOWABLE EXPOSURE LIMITS FOR CARBON DIOXIDE DURING EXTRAVEHICULAR ACTIVITY

ANDREW J. SETER Apr. 1993 42 p

(Contract RTOP 506-71-00)

(NASA-TM-103832; A-91045; NAS 1.15:103832) Avail: CASI HC A03/MF A01

The intent was to review the research pertaining to human exposure to carbon dioxide (CO2) and to recommend allowable exposure limits for extravehicular activity (EVA). Respiratory, renal, and gastrointestinal systems may be adversely affected by chronic low dose CO2 exposure. Ventilation was increased 15 percent with 1 percent CO2 and 50 percent with 2 percent CO2. Chronic exposure to less than 2 percent CO2 led to 20 day cycles of uncompensated and compensated respiratory acidosis. Acid-base changes were small. Histopathologic changes in guinea pig lungs have been noted with long term exposure to 1 percent CO2. No changes were seen with exposure to 0.5 percent CO2. Cycling of bone calcium stores with associated changes in blood and urinary calcium levels occurs with long term CO2 exposure. Histologic changes in bone have been noted in guinea pigs exposed to 1 percent CO2. Renal calcification has been noted in guinea pigs with exposure to as low as 0.5 percent CO2. An increase in gastric acidity was noted in subjects with long term exposure to 1 percent CO2. Cardiovascular and neurologic function were largely unaffected. A decrease in the incidence of respiratory, renal, and gastrointestinal disease was noted in submariners coincident with a decrease in ambient CO2 from 1.2 percent to 0.8-0.9 percent. Oxygen (O2) and CO2 stimulate respiration independently and cumulatively. The addition of CO2 to high dose O2 led to the faster onset of seizure activity in mice. Experiments evaluating the physiologic responses to intermittent, repetitive exposures to low dose CO2 and 100 percent O2 mixtures should be performed. A reduction in the current NASA standard for CO2 exposure during EVA of 1 percent (7.6 mmHg) for nominal and 2 percent (15.2 mmHg) for heavy exertion to 0.5 percent (3.8 mmHg) for nominal and 1 percent (7.6 mmHg) for heavy exertion may be prudent. At a minimum, the current NASA standard should not be liberalized. Author (revised)

N94-11528*# Veterans Administration Hospital, Sepulveda, CA.

QUANTITATIVE EEG PATTERNS OF DIFFERENTIAL IN-FLIGHT WORKLOAD

M. B. STERMAN, C. A. MANN, and D. A. KAISER *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 466-473 Feb. 1993 Prepared in cooperation with California Univ., Los Angeles

Avail: CASI HC A02/MF A03

Four test pilots were instrumented for in-flight EEG recordings using a custom portable recording system. Each flew six, two minute tracking tasks in the Calspan NT-33 experimental trainer at Edwards AFB. With the canopy blacked out, pilots used a HUD display to chase a simulated aircraft through a random flight course. Three configurations of flight controls altered the flight characteristics to achieve low, moderate, and high workload, as determined by normative Cooper-Harper ratings. The test protocol was administered by a command pilot in the back seat. Corresponding EEG and tracking data were compared off-line. Tracking performance was measured as deviation from the target aircraft and combined with control difficulty to achieve an estimate of 'cognitive workload'. Trended patterns of parietal EEG activity at 8-12 Hz were sorted according to this classification. In all cases, high workload produced a significantly greater suppression of 8-12 Hz activity than low workload. Further, a clear differentiation of EEG trend patterns was obtained in 80 percent of the cases. High workload produced a sustained suppression of 8-12 Hz activity, while moderate workload resulted in an initial suppression followed by a gradual increment. Low workload was associated with a modulated pattern lacking any periods of marked or sustained suppression. These findings suggest that quantitative analysis of appropriate EEG measures may provide an objective and reliable in-flight index of cognitive effort that could facilitate workload assessment. Author (revised)

N94-11529*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH Human Engineering Div.

PSYCHOPHYSIOLOGICAL MEASURES OF COGNITIVE WORKLOAD IN LABORATORY AND FLIGHT

GLENN F. WILSON and ALBERT BADEAU *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 474-481 Feb. 1993

Avail: CASI HC A02/MF A03

Psychophysiological data have been recorded during different levels of cognitive workload in laboratory and flight settings. Cardiac, eye blink, and brain data have shown meaningful changes as a function of the levels of mental workload. Increased cognitive workload is generally associated with increased heart rates, decreased blink rates and eye closures, and decreased evoked potential amplitudes. However, comparisons of laboratory and flight data show that direct transference of laboratory findings to the flight environment is not possible in many cases. While the laboratory data are valuable, a data base from flight is required so that 'real world' data can be properly interpreted. Author (revised)

N94-11537*# Lockheed Engineering and Sciences Co., Houston, TX.

MEASURING HUMAN PERFORMANCE ON NASA'S MICROGRAVITY AIRCRAFT

RANDY B. MORRIS and MIHRIBAN WHITMORE *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 516-521 Feb. 1993

Avail: CASI HC A02/MF A03

Measuring human performance in a microgravity environment will aid in identifying the design requirements, human capabilities, safety, and productivity of future astronauts. The preliminary understanding of the microgravity effects on human performance

can be achieved through evaluations conducted onboard NASA's KC-135 aircraft. These evaluations can be performed in relation to hardware performance, human-hardware interface, and hardware integration. Measuring human performance in the KC-135 simulated environment will contribute to the efforts of optimizing the human-machine interfaces for future and existing space vehicles. However, there are limitations, such as limited number of qualified subjects, unexpected hardware problems, and miscellaneous plane movements which must be taken into consideration. Examples for these evaluations, the results, and their implications are discussed in the paper. Author (revised)

N94-11540*# Krug Life Sciences, Inc., San Antonio, TX.
USE OF ULTRASOUND IN ALTITUDE DECOMPRESSION MODELING Abstract Only
ROBERT M. OLSON and ANDREW A. PILMANIS (Aerospace Medical Research Labs., Brooks AFB, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 543 Feb. 1993
Avail: CASI HC A01/MF A03

A model that predicts the probability of developing decompression sickness (DCS) with various denitrogenation schedules is being developed by the Armstrong Laboratory, using human data from previous exposures. It was noted that refinements are needed to improve the accuracy and scope of the model. A commercially developed ultrasonic echo imaging system is being used in this model development. Using this technique, bubbles images from a subject at altitude can be seen in the gall bladder, hepatic veins, vena cava, and chambers of the heart. As judged by their motion and appearance in the vena cava, venous bubbles near the heart range in size from 30 to 300 M. The larger bubbles skim along the top, whereas the smaller ones appear as faint images near the bottom of the vessel. Images from growing bubbles in a model altitude chamber indicate that they grow rapidly, going from 20 to 100 M in 3 sec near 30,000 ft altitude. Information such as this is valuable in verifying those aspects of the DCS model dealing with bubble size, their growth rate, and their site of origin. Author (revised)

N94-11541*# Krug Life Sciences, Inc., San Antonio, TX.
HYPOBARIC DECOMPRESSION PREBREATHE REQUIREMENTS AND BREATHING ENVIRONMENT Abstract Only
JAMES T. WEBB and ANDREW A. PILMANIS (Aerospace Medical Research Labs., Brooks AFB, TX.) *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 544 Feb. 1993
Avail: CASI HC A01/MF A03

To reduce incidence of decompression sickness (DCS), prebreathing 100 percent oxygen to denitrogenate is required prior to hypobaric decompressions from a sea level pressure breathing environment to pressures lower than 350 mm Hg (20,000 ft; 6.8 psia). The tissue ratio (TR) of such exposures equals or exceeds 1.7; TR being the tissue nitrogen pressure prior to decompression divided by the total pressure after decompression (((0.781)(14.697))/6.758). Designing pressure suits capable of greater pressure differentials, lower TR's, and procedures which limit the potential for DCS occurrence would enhance operational efficiency. The current 10.2 psia stage decompression prior to extravehicular activity (EVA) from the Shuttle in the 100 percent oxygen, 4.3 psia suit, results in a TR of 1.65 and has proven to be relatively free of DCS. Our recent study of zero-prebreathe decompressions to 6.8 psia breathing 100 percent oxygen (TR = 1.66) also resulted in no DCS (N = 10). The level of severe, Spencer Grades 3 or 4, venous gas emboli (VGE) increased from 0 percent at 9.5 psia to 40 percent at 6.8 psia yielding a Probit curve of VGE risk for the 51 male subjects who participated in these recent studies. Earlier, analogous decompressions using a 50 percent oxygen, 50 percent nitrogen breathing mixture resulted in one case of DCS and significantly higher levels of severe VGE, e.g., at 7.8 psia, the mixed gas breathing environment resulted in a 56 percent incidence of severe VGE versus 10 percent with use of 100 percent oxygen. The report of this study recommended use of 100 percent oxygen during zero-prebreathe exposure to 6.8 psia if such a suit could be developed. For future, long-term missions, we suggest study of the effects of decompression over several days to a breathing environment of 150 mmHg O2 and approximately 52 mmHg He as a means of eliminating DCS and VGE hazards during subsequent excursions. Once physiologically adapted to a 4 psia vehicle, base, or space station segment, crew members could use greatly simplified EVA suits with greater mobility and no prebreathe requirement. Author (revised)

N94-11549*# Aerospace Medical Research Labs., Brooks AFB, TX. Sustained Operations Branch.
A PROTOTYPE URINE COLLECTION DEVICE FOR FEMALE AIRCREW
ROGER U. BISSON and KARLYNA L. DELGER *In* NASA. Johnson Space Center, Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 570-573 Feb. 1993
Avail: CASI HC A01/MF A03

Women are gaining increased access to small military cockpits. This shift has stimulated the search for practical urine containment and disposal methods for female aircrew. There are no external urine collection devices (UCD) for women that are comfortable, convenient, and leak free. We describe a prototype UCD that begins to meet this need. Materials used to make custom aviator masks were adapted to mold a perineal mask. First, a perineal cast (negative) was used to make a mold (positive). Next, a perineal mask made of wax was formed to fit the positive mold. Finally, a soft, pliable perineal mask was fabricated using the wax model as a guide. The prototype was tested for comfort, fit, and leakage. In the sitting position, less than 5 cc of urine leakage occurred with each 600 cc of urine collected. Comfort was mostly satisfactory, but ambulation was limited and the outlet design could lead to kinking and obstruction. We concluded that a perineal mask may serve as a comfortable and functional external UCD acceptable for use by females in confined environments. Changes are needed to improve comfort, fit, and urine drainage. Integration into cockpits, pressure suits, chemical defense gear, and environments where access to relief facilities is restricted is planned. Author (revised)

N94-11553*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COMPREHENSIVE ANALYSIS OF AIRBORNE CONTAMINANTS FROM RECENT SPACELAB MISSIONS
M. L. MATNEY (Krug Life Sciences, Inc., Houston, TX.), J. F. BOYD (Krug Life Sciences, Inc., Houston, TX.), P. A. COVINGTON (Krug Life Sciences, Inc., Houston, TX.), H. J. LEANO (Krug Life Sciences, Inc., Houston, TX.), D. L. PIERSON, T. F. LIMERO (Krug Life Sciences, Inc., Houston, TX.), and J. T. JAMES *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 579-588 Feb. 1993
Avail: CASI HC A02/MF A03

The Shuttle experiences unique air contamination problems because of microgravity and the closed environment. Contaminant build-up in the closed atmosphere and the lack of a gravitational settling mechanism have produced some concern in previous missions about the amount of solid and volatile airborne contaminants in the Orbiter and Spacelab. Degradation of air quality in the Orbiter/Spacelab environment, through processes such as chemical contamination, high solid-particulate levels, and high microbial levels, may affect crew performance and health. A comprehensive assessment of the Shuttle air quality was undertaken during STS-40 and STS-42 missions, in which a variety of air sampling and monitoring techniques were employed to determine the contaminant load by characterizing and quantitating airborne contaminants. Data were collected on the airborne concentrations of volatile organic compounds, microorganisms, and particulate matter collected on Orbiter/Spacelab air filters. The results showed that STS-40/42 Orbiter/Spacelab air was toxicologically safe to breathe, except during STS-40 when the Orbiter Refrigerator/Freezer unit was releasing noxious gases in the middeck. On STS-40, the levels of airborne bacteria appeared

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to increase as the mission progressed; however, this trend was not observed for the STS-42 mission. Particulate matter in the Orbiter/Spacelab air filters was chemically analyzed in order to determine the source of particles. Only small amounts of rat hair and food bar (STS-40) and traces of soiless medium (STS-42) were detected in the Spacelab air filters, indicating that containment for Spacelab experiments was effective. Author (revised)

N94-11554*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TOXICITY STUDY OF DIMETHYLETHOXYSILANE (DMSES), THE WATERPROOFING AGENT FOR THE ORBITER HEAT PROTECTIVE SYSTEM Abstract Only

CHIU-WING LAM (Krug Life Sciences, Inc., Houston, TX.), JOHN T. JAMES, DAROL DODD (ManTech Environmental Technology, Inc., Upton, NY.), BRUCE STUART (ManTech Environmental Technology, Inc., Upton, NY.), SIMON ROTHENBERG (ManTech Environmental Technology, Inc., Upton, NY.), MARY ANN KERSHAW (Brookhaven National Lab., Upton, NY.), and A. THILAGAR (Sitek Research Labs., Rockville, MD.) *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 589 Feb. 1993

Avail: CASI HC A01/MF A03

DMES, a volatile liquid, is used by NASA to waterproof the Orbiter thermal protective system. During waterproofing operations at the Oribter Processing Facility at KSC, workers could be exposed to DMES vapor. To assess the toxicity of DMES, acute and subchronic (2-week and 13-week) inhalation studies were conducted with rats. Studies were also conducted to assess the potential of DMES. Inhalation exposure concentrations ranged from 40 ppm to 4000 ppm. No mortality was observed during the studies. Exposures to 2100 ppm produced narcosis and ataxia. Post-exposure recovery from these CNS effects was rapid (less than 1 hr). These effects were concentration-dependent and relatively independent of exposure length. Exposure to 3000 ppm for 2 weeks (5 h/d, 5 d/wk) produced testicular toxicity. The 13-week study yielded similar results. Results from the genotoxicity assays (in vivo/in vitro unscheduled DNA synthesis in rat primary heptaocytes, chromosomal aberrations in rat bone marrow cells; reverse gene mutation in Salmonella typhimurium; and forward mutation in Chinese hamster culture cells) were negative. These studies indicated that DMES is mildly to moderately toxic but not a multagen. Author (revised)

N94-11555*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A COMBUSTION PRODUCTS ANALYZER FOR CONTINGENCY USE DURING THERMODEGRADATION EVENTS ON SPACECRAFT

STEVE WILSON (Krug Life Sciences, Inc., Houston, TX.), THOMAS F. LIMERO (Krug Life Sciences, Inc., Houston, TX.), STEVE W. BECK (Krug Life Sciences, Inc., Houston, TX.), and JOHN T. JAMES *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 590-596 Feb. 1993

Avail: CASI HC A02/MF A03

The Toxicology Laboratory at JSC and Exidyne Instrumentation Technologies (EIT) have developed a prototype Combustion Products Analyzer (CPA) to monitor, in real time, combustion products from a thermodegradation event on board spacecraft. The CPA monitors the four gases that are the most hazardous compounds (based on the toxicity potential and quantity produced) likely to be released during thermodegradation of synthetic materials: hydrogen fluoride (HF), hydrogen chloride (HCl), hydrogen cyanide (HCN), and carbon monoxide (CO). The levels of these compounds serve as markers to assist toxicologists in determining when the cabin atmosphere is safe for the crew to breathe following the contingency event. The CPA is a hand-held, battery-operated instrument containing four electrochemical sensors, one for each target gas, and a pump for drawing air across the sensors. The sensors are unique in their small size and zero-g compatibility. The immobilized electrolytes in each sensor permit the instrument to function in space and eliminate the possibility of electrolye leaks. The sample inlet system is equipped with a particulate filter that prevents clogging from airborne particulate matter. The CPA has a large digital display for gas concentrations and warming signals for low flow and low battery conditions. The CPA has flown on 13 missions beginning with STS 41 in Oct. 1990. Current efforts include the development of a microprocessor, an improved carbon monoxide sensor, and a ground-based test program to evaluate the CPA during actual thermodegradation of selected materials. Author (revised)

N94-11561*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

OPERATIONAL RADIOLOGICAL SUPPORT FOR THE US MANNED SPACE PROGRAM Abstract Only

MICHAEL J. GOLIGHTLY, ALVA C. HARDY, WILLIAM ATWELL (Rockwell International Corp., Houston, TX.), MARK D. WEYLAND (Rockwell International Corp., Houston, TX.), JOHN KERN (Rockwell International Corp., Houston, TX.), and BERNARD L. CASH (Lockheed Engineering and Sciences Co., Houston, TX.) *In its* Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), Volume 2 p 614 Feb. 1993

Avail: CASI HC A01/MF A03

Radiological support for the manned space program is provided by the Space Radiation Analysis Group at NASA/JSC. This support ensures crew safety through mission design analysis, real-time space environment monitoring, and crew exposure measurements. Preflight crew exposure calculations using mission design information are used to ensure that crew exposures will remain within established limits. During missions, space environment conditions are continuously monitored from within the Mission Control Center. In the event of a radiation environment enhancement, the impact to crew exposure is assessed and recommendations are provided to flight management. Radiation dosimeters are placed throughout the spacecraft and provided to each crewmember. During a radiation contingency, the crew could be requested to provide dosimeter readings. This information would be used for projecting crew dose enhancements. New instrumentation and computer technology are being developed to improve the support. Improved instruments include tissue equivalent proportional counter (TEPC)-based dosimeters and charged particle telescopes. Data from these instruments will be telemetered and will provide flight controllers with unprecedented information regarding the radiation environment in and around the spacecraft. New software is being acquired and developed to provide 'smart' space environmental data displays for use by flight controllers. Author (revised)

N94-11627*# ECC International Corp., Orlando, FL.

TEACHING HIGH-PERFORMANCE SKILLS USING ABOVE-REAL-TIME TRAINING

DUTCH GUCKENBERGER, KEVIN C. ULIANO (University of Central Florida, Orlando.), and NORMAN E. LANE (University of Central Florida, Orlando.) Aug. 1993 60 p Sponsored by NASA. Dryden Flight Research Facility

(Contract NAG2-750; RTOP 505-68-00)

(NASA-CR-4528; H-1919; NAS 1.26:4528) Avail: CASI HC A04/MF A01

The above real-time training (ARTT) concept is an approach to teaching high-performance skills. ARTT refers to a training paradigm that places the operator in a simulated environment that functions at faster than normal time. It represents a departure from the intuitive, but not often supported, feeling that the best practice is determined by the training environment with the highest fidelity. This approach is hypothesized to provide greater 'transfer value' per simulation trial, by incorporating training techniques and instructional features into the simulator. Two related experiments are discussed. In the first, 25 naive male subjects performed three tank gunnery tasks on a simulator under varying levels of time acceleration (i.e., 1.0x, 1.6x, 2.0x, sequential, and mixed). They were then transferred to a standard (1.0x) condition for testing. Every accelerated condition or combination of conditions produced better training and transfer than the standard condition. Most effective was the presentation of trials at 1.0x, 1.6x, and 2.0x in a

random order during training. Overall, the best ARTT group scored about 50 percent higher and trained in 25 percent less time compared to the real-time control group. In the second experiment, 24 mission-capable F-16 pilots performed three tasks on a part-task F-16A flight simulator under varying levels of time compression (i.e., 1.0x, 1.5x, 2.0x, and random). All subjects were then tested in a real-time environment. The emergency procedure (EP) task results showed increased accuracy for the ARTT groups. In testing (transfer), the ARTT groups not only performed the EP more accurately, but dealt with a simultaneous enemy significantly better than a real-time control group. Although the findings on an air combat maneuvering task and stern conversion task were mixed, most measures indicated that the ARTT groups performed better and faster than a real-time control group. Other implications for ARTT are discussed along with future research directions.
Author (revised)

N94-11642# Aeronautical Systems Div., Wright-Patterson AFB, OH.
A COMPARISON OF HEAD-UP AND HEAD-DOWN DISPLAY FORMATS DURING INSTRUMENT FLYING TASKS Final Report, Mar. 1991 - Oct. 1992
THOMAS C. HUGHES, JOHN A. HASSOUN, and JAMES M. BARNABA Nov. 1992 109 p
(AD-A266140; ASC-TR-93-5003) Avail: CASI HC A06/MF A02

In March 1989, the Chief of Staff of the Air Force issued a study regarding the status of instrument flying within the Air Force. In that report, specific recommendations were presented, first of which was the necessity to develop a standardized HUD format suitable for use as a primary flight reference. Since that time a HUD symbology set was proposed and adopted conditional upon final validation as a primary flight reference. The present report documents the simulation phase of the validation process in which a total of 38 pilots participated. The validation of the symbology set consisted of a comparison of pilot performance data during three instrument flight tasks (1) Unusual Attitude Recovery, (2) Precision Approach, and (3) Precision Instrument Maneuvering. Results indicated that pilot data were significantly improved while flying with the HUD during the Precision Approach and Instrument Maneuvering tasks. During the Unusual Attitude Recovery tasks, no significant differences were demonstrated; however, the HUD symbology showed a trend toward faster reaction times, particularly for the nose low recoveries. Based on these results, the CSEF recommended initiation of the follow-on flight test phase of the validation process.
DTIC

N94-12346# Air Force Systems Command, Wright-Patterson AFB, OH. Armstrong Lab.
ACCURACY AND REPEATABILITY OF THE STANDARD AUTOMATED MASS PROPERTIES MEASUREMENT SYSTEM Interim Report, Dec. 1991 - Sep. 1992
BRIAN P. SELF, ERIC K. SPITTLE, INTS KALEPS, and CHRISTOPHER ALBERY Sep. 1992 54 p
(Contract AF PROJ. 7231)
(AD-A265897; AL-TR-1992-0137) Avail: CASI HC A04/MF A01

The injury potential to pilots may be significantly affected by the inertial properties of helmet-mounted equipment. In order to accurately assess the effects of such equipment, reliable measurements of mass, center of mass, and mass moments of inertia must be obtained. The Manikin Testing Laboratory at the Armstrong Laboratory has developed the Standard Automated Mass Properties (STAMP) system to experimentally determine the inertial properties of various objects. It is necessary to quantitatively determine the accuracy and repeatability of measurements obtained by the STAMP system to confidently use these values in analytical models, in correlations between observed empirical response and the inertial properties of head-mounted equipment, and in determining compliance with inertial properties specifications of new helmet-mounted systems.
DTIC

N94-12365*# Iowa State Univ. of Science and Technology, Ames. Inst. for Physical Research and Technology.
SPACE LIFE SUPPORT ENGINEERING PROGRAM Annual Progress Report, 1 Jul. 1992 - 30 Jun. 1993
RICHARD C. SEAGRAVE 30 Jun. 1993 245 p
(Contract NAG2-722)
(NASA-CR-193474; NAS 1.26:193474) Avail: CASI HC A11/MF A03

This report covers the second year of research relating to the development of closed-loop long-term life support systems. Emphasis was directed toward concentrating on the development of dynamic simulation techniques and software and on performing a thermodynamic systems analysis in an effort to begin optimizing the system needed for water purification. Four appendices are attached. The first covers the ASPEN modeling of the closed loop Environmental Control Life Support System (ECLSS) and its thermodynamic analysis. The second is a report on the dynamic model development for water regulation in humans. The third regards the development of an interactive computer-based model for determining exercise limitations. The fourth attachment is an estimate of the second law thermodynamic efficiency of the various units comprising an ECLSS.

N94-12366*# Iowa State Univ. of Science and Technology, Ames.
SYSTEMS ANALYSIS OF A CLOSED LOOP ECLSS USING THE ASPEN SIMULATION TOOL. THERMODYNAMIC EFFICIENCY ANALYSIS OF ECLSS COMPONENTS M.S. Thesis
SHARMISTA CHATTERJEE *In its* Space Life Support Engineering Program 135 p 30 Jun. 1993
Avail: CASI HC A07/MF A03

Our first goal in this project was to perform a systems analysis of a closed loop Environmental Control Life Support System (ECLSS). This pertains to the development of a model of an existing real system from which to assess the state or performance of the existing system. Systems analysis is applied to conceptual models obtained from a system design effort. For our modelling purposes we used a simulator tool called ASPEN (Advanced System for Process Engineering). Our second goal was to evaluate the thermodynamic efficiency of the different components comprising an ECLSS. Use is made of the second law of thermodynamics to determine the amount of irreversibility of energy loss of each component. This will aid design scientists in selecting the components generating the least entropy, as our penultimate goal is to keep the entropy generation of the whole system at a minimum.
Derived from text

N94-12367*# Iowa State Univ. of Science and Technology, Ames.
PHYSIOLOGICAL WATER MODEL DEVELOPMENT
SUSAN DOTY *In its* Space Life Support Engineering Program 29 p 30 Jun. 1993
Avail: CASI HC A03/MF A03

The water of the human body can be categorized as existing in two main compartments: intracellular water and extracellular water. The intracellular water consists of all the water within the cells and constitutes over half of the total body water. Since red blood cells are surrounded by plasma, and all other cells are surrounded by interstitial fluid, the intracellular compartment has been subdivided to represent these two cell types. The extracellular water, which includes all of the fluid outside of the cells, can be further subdivided into compartments which represent the interstitial fluid, circulating blood plasma, lymph, and transcellular water. The interstitial fluid surrounds cells outside of the vascular system whereas plasma is contained within the blood vessels. Avascular tissues such as dense connective tissue and cartilage contain interstitial water which slowly equilibrates with tracers used to determine extracellular fluid volume. For this reason, additional compartments are sometimes used to represent these avascular tissues. The average size of each compartment, in terms of percent body weight, has been determined for adult males and females. These compartments and the forces which cause flow between them are presented. The kidneys, a main compartment, receive

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about 25 percent of the cardiac output and filters out a fluid similar to plasma. The composition of this filtered fluid changes as it flows through the kidney tubules since compounds are continually being secreted and reabsorbed. Through this mechanism, the kidneys eliminate wastes while conserving body water, electrolytes, and metabolites. Since sodium accounts for over 90 percent of the cations in the extracellular fluid, and the number of cations is balanced by the number of anions, considering the renal handling sodium and water only should sufficiently describe the relationship between the plasma compartment and kidneys. A kidney function model is presented which has been adapted from a previous model of normal renal function in man. To test the validity of the proposed kidney model, results predicted by the model will be compared to actual data involving injected or ingested fluids and subsequent urine flow rates. Comparison of the model simulation to actual data following the ingestion of 1 liter of water is shown. The model simulation is also shown with actual data following the intravenous infusion of hypertonic saline. Derived from text

N94-12368*# Iowa State Univ. of Science and Technology, Ames. Dept. of Chemical Engineering.

MODIFICATIONS TO AN INTERACTIVE MODEL OF THE HUMAN BODY DURING EXERCISE: WITH SPECIAL EMPHASIS ON THERMOREGULATION M.S. Thesis

MEGAN KAY SCHERB *In its* Space Life Support Engineering Program 64 p 30 Jun. 1993

Avail: CASI HC A04/MF A03

Since 1988 an interactive computer model of the human body during exercise has been under development by a number of undergraduate students in the Department of Chemical Engineering at Iowa State University. The program, written under the direction of Dr. Richard C. Seagrave, uses physical characteristics of the user, environmental conditions and activity information to predict the onset of hypothermia, hyperthermia, dehydration, or exhaustion for various levels and durations of a specified exercise. The program however, was severely limited in predicting the onset of dehydration due to the lack of sophistication with which the program predicts sweat rate and its relationship to sensible water loss, degree of acclimatization, and level of physical training. Additionally, it was not known whether sweat rate also depended on age and gender. For these reasons, the goal of this creative component was to modify the program in the above mentioned areas by applying known information and empirical relationships from literature. Furthermore, a secondary goal was to improve the consistency with which the program was written by modifying user input statements and improving the efficiency and logic of the program calculations. Derived from text

N94-12369*# Iowa State Univ. of Science and Technology, Ames.

AN ESTIMATE OF THE SECOND LAW THERMODYNAMIC EFFICIENCY OF THE VARIOUS UNITS COMPRISING AN ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ECLSS)

SHARMISTA CHATTERJEE and RICHARD C. SEAGRAVE *In its* Space Life Support Engineering Program 12 p 30 Jun. 1993 Presented at the International Conference on Environmental Science, Jul. 1993

Avail: CASI HC A03/MF A03

The objective of this paper is to present an estimate of the second law thermodynamic efficiency of the various units comprising an Environmental Control and Life Support System (ECLSS). The technique adopted here is based on an evaluation of the 'lost work' within each functional unit of the subsystem. Pertinent information for our analysis is obtained from a user interactive integrated model of an ECLSS. The model was developed using ASPEN. A potential benefit of this analysis is the identification of subsystems with high entropy generation as the most likely candidates for engineering improvements. This work has been motivated by the fact that the design objective for a long term mission should be the evaluation of existing ECLSS technologies not only the basis of the quantity of work needed for or obtained from each subsystem but also on the quality of work. In a previous study Brandhorst showed that the power consumption for partially closed and completely closed regenerable life support systems was estimated as 3.5 kw/individual and 10-12 kw/individual respectively. With the increasing cost and scarcity of energy resources, our attention is drawn to evaluate the existing ECLSS technologies on the basis of their energy efficiency. In general the first law efficiency of a system is usually greater than 50 percent. From literature, the second law efficiency is usually about 10 percent. The estimation of second law efficiency of the system indicates the percentage of energy degraded as irreversibilities within the process. This estimate offers more room for improvement in the design of equipment. From another perspective, our objective is to keep the total entropy production of a life support system as low as possible and still ensure a positive entropy gradient between the system and the surroundings. The reason for doing so is as the entropy production of the system increases, the entropy gradient between the system and the surroundings decreases, and the system will gradually approach equilibrium with the surroundings until it reaches the point where the entropy gradient is zero. At this point no work can be extracted from the system. This is called the 'dead state' of the system. Author

N94-12935 Systems Research Labs., Inc., Dayton, OH.

EVALUATION OF THE RETROGRADE INFLATION ANTI-G SUIT (RIAGS) Final Report, Oct. 1989 - 1992

LLOYD D. TRIPP, JR., KATHY MCCLOSKEY, DANIEL REPPERGER, STEPHEN E. POPPER, and SMITH L. JOHNSTON 18 Dec. 1992 16 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F33615-89-C-0574)

(AD-A265884; AL-TR-1992-0176) Avail: CASI HC A03

The Retrograde Inflation Anti-G Suit (RIAGS) was originally designed and fabricated in the early 1940's by Mr. David Clark and Dr. Earl Wood as The Progressive Arterial Occlusion Anti-g Suit. Testing of this suit on the Mayo Clinic centrifuge revealed that the suit provided more g protection than the fighter pilot of the era needed (+2.9 gz relaxed). This technology was revisited in 1987 by the Armstrong Laboratory and culminated in the development of a new version of the technology using modern methods and materials. The new suit consisted of a retrograde inflating anti-g suit which inflated cephaladward, arterial occlusive cuffs for the arms, and capstan sleeves. These suit combinations were compared to the standard Air Force issue CSU-13B/P anti-g suit. Endurance testing of the current suit involved exposing subjects to a continuous +4.5 to +7 gz Simulated Aerial Combat Maneuver. Results showed the RIAGS with capstan sleeves provided the maximum amount of protection to the subject in terms of endurance (p less than 0.013), followed by RIAGS alone (p less than 0.058), Standard CSU-13B/P and RIAGS with occlusion cuffs (p=0.28). In addition to the protection issue, RIAGS with sleeves also proved to be the most comfortable of all the g suit combinations evaluated. DTIC

N94-13132*# Vexcel Corp., Boulder, CO.

EOS WORKSTATION Final Report, 2 Jun. 1989 - 3 Jan. 1992

FRANZ LEBERL, MILAN KARSPECK, MICHEL MILLOT, KELLY MAURICE, and MATT JACKSON 7 Apr. 1992 365 p

(Contract NAS7-1070; SBIR-07.07-0094)

(NASA-CR-191326; NAS 1.26:191326) Avail: CASI HC A16/MF A03

This final report summarizes the work done from mid-1989 until January 1992 to develop a prototype set of tools for the analysis of EOS-type images. Such images are characterized by great multiplicity and quantity. A single 'snapshot' of EOS-type imagery may contain several hundred component images so that on a particular pixel, one finds multiple gray values. A prototype EOS-sensor, AVIRIS, has 224 gray values at each pixel. The work focused on the ability to utilize very large images and continuously roam through those images, zoom and be able to hold more than one black and white or color image, for example for stereo viewing or for image comparisons. A second focus was the utilization of

so-called 'image cubes', where multiple images need to be co-registered and then jointly analyzed, viewed, and manipulated. The target computer platform that was selected was a high-performance graphics superworkstation, Stardent 3000. This particular platform offered many particular graphics tools such as the Application Visualization System (AVS) or Dore, but it missed availability of commercial third-party software for relational data bases, image processing, etc. The project was able to cope with these limitations and a phase-3 activity is currently being negotiated to port the software and enhance it for use with a novel graphics superworkstation to be introduced into the market in the Spring of 1993. Author (revised)

N94-13229 Tel-Aviv Univ. (Israel). Dept. of Interdisciplinary Studies.

BODY/CUSHION CONTACT STRESS ANALYSIS DURING SITTING M.S. Thesis

SILVIU COMISIONERU Sep. 1991 154 p

(ITN-93-85204) Copyright Avail: Issuing Activity (Tel-Aviv Univ., Exact Sciences Library, Ramat Aviv 69978, Israel)

Suitably designed cushions could minimize body stresses experienced during sitting for long periods and the consequent discomfort and pain. A series of two-dimensional numerical models of the pelvis-cushion system and the stresses developed in the body as a result of sitting on various types of cushion were analysed by means of the ANSYS finite-element program. Experimental measurements were made by means of the Contact Pressure Display (CPD) and the Piezoresistive Sensor Array (PSA). It was shown that the use of composite cushions, comprising layers of various thicknesses, made of materials of various mechanical properties, could provide a quasi-uniform stress distribution, with consequently reduced stresses on the skeleton and soft tissues. It was demonstrated that the achievement of such a quasi-uniform stress distribution is a fundamental condition for comfort. Cushion design guidelines were developed based on the need to use softer materials in high-stress regions and stiffer materials in low-stress regions, with a lower layer sufficiently stiff to prevent contact between the ischial tuberosities and the rigid base. Other applications of composite cushion design are in protecting the human body against vibration and impact stresses and in protecting paraplegic and geriatric patients against pressure ulcer development, caused by prolonged sitting without change of posture. For such patients, the cushion design and optimization must be done on an individual basis. ISA

N94-13315*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

VISUAL CUEING CONSIDERATIONS IN NAP-OF-THE-EARTH HELICOPTER FLIGHT HEAD-SLAVED HELMET-MOUNTED DISPLAYS

ARTHUR J. GRUNWALD and SILVIA KOHN (Technion - Israel Inst. of Engineering, Haifa.) *In its* Piloting Vertical Flight Aircraft: A Conference on Flying Qualities and Human Factors p 315-327 Jul. 1993

Avail: CASI HC A03/MF A04

The pilot's ability to derive Control-Oriented Visual Field Information from teleoperated Helmet-Mounted displays in Nap-of-the-Earth flight, is investigated. The visual field with these types of displays, commonly used in Apache and Cobra helicopter night operations, originates from a relatively narrow field-of-view Forward Looking Infrared Radiation Camera, gimbal-mounted at the nose of the aircraft and slaved to the pilot's line-of-sight, in order to obtain a wide-angle field-of-regard. Pilots have encountered considerable difficulties in controlling the aircraft by these devices. Experimental simulator results presented here indicate that part of these difficulties can be attributed to head/camera slaving system phase lags and errors. In the presence of voluntary head rotation, these slaving system imperfections are shown to impair the Control-Oriented Visual Field Information vital in vehicular control, such as the perception of the anticipated flight path or the vehicle yaw rate. Since, in the presence of slaving system imperfections, the pilot will tend to minimize head rotation, the full wide-angle field-of-regard of the line-of-sight slaved Helmet-Mounted Display, is not always fully utilized. Author (revised)

N94-13319*# Helikopter Service A/S, Oslo (Norway).

HUMAN FACTOR IMPLICATIONS OF THE EUROCOPTER AS332L-1 SUPER PUMA COCKPIT

R. RANDALL PADFIELD *In* NASA. Ames Research Center, Piloting Vertical Flight Aircraft: A Conference on Flying Qualities and Human Factors p 377-392 Jul. 1993 Presented at the 15th European Rotorcraft Forum, Amsterdam, The Netherlands, 12-15 Sep. 1989 Previously announced in AIAA as A91-45400

Avail: CASI HC A03/MF A04

The purpose of this paper is to identify and describe some of the human factor problems which can occur in the cockpit of a modern civilian helicopter. After examining specific hardware and software problems in the cockpit design of the Eurocopter (Aerospatiale) AS332L-1 Super Puma, the author proposes several principles that can be used to avoid similar human factors problems in the design of future cockpits. These principles relate to the use and function of warning lights, the design of autopilots in two-pilot aircraft, and the labeling of switches and warning lights, specifically with respect to abbreviations and translations from languages other than English. In the final section of the paper, the author describes current trends in society which he suggests should be taken into consideration when designing future aircraft cockpits. Author

N94-13388# National Aerospace Lab., Tokyo (Japan). Space Technology Research Group.

EVALUATION FOR MEMBRANE COMPONENTS OF WATER RECYCLING SYSTEM [MIZU SAISEI JUNKAN SHISUTEMU YOUSO NO TOKUSEI HYOUKA]

TOSHIHARU TANEMURA, KOUJI OOTSUBO, MITSUO OGUCHI, AKIRA ASHIDA (Hitachi Ltd., Tokyo, Japan.), NOBUO HAMANO (Hitachi Ltd., Tokyo, Japan.), and KENJI MITANI (Hitachi Ltd., Tokyo, Japan.) Apr. 1992 33 p In JAPANESE

(ISSN 0452-2982)

(NAL-TM-646; JTN-93-80481) Avail: CASI HC A03/MF A01

The water recycling system is a key subsystem of the integrated material recycling system which must be developed to obtain long-term, manned space activity. This paper presents the results of system study for designing water recycling system in which three kinds of membrane filters are introduced to purify waste water discharged from men, animals, and plants. In addition, the long duration processing tests utilizing artificial urine waste water were conducted to evaluate the appropriateness of adopting these membrane filters. Author (NASDA)

N94-13399*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ANALYSIS OF DIFFERENCES BETWEEN SEATING POSITIONS IN SIMULATORS AND ORBITERS

PHILIP T. MONGAN Sep. 1993 13 p

(NASA-TM-104776; S-730; NAS 1.15:104776) Avail: CASI HC A03/MF A01

Crew comments indicate that Space Shuttle simulator seats place crewmembers in a position different from that of the actual Orbiter seats. The crew feel that they launch in a different position, and with a different reach and visibility, from that in which they had trained. This study examined three factors in differences between training and flight positions. Key dimensions, which were considered important to spatial orientation, were compared in the Orbiters and simulators. These were dimensions such as seat back to glare shield and seat pan to overhead. The differences between flight and training crew equipment, and how these differences may contribute to the problem were discussed with engineers and technicians responsible for the equipment. Eye position measurements were taken on subjects to assess any differences that could be attributed to different ingress methods in the Orbiters and the simulators. This report presents the data analysis, and recommendations. Author (revised)

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N94-13472# Japan Manned Space Systems Corp., Tokyo.
SURVEY AND STUDY ON ENVIRONMENTAL CONTROL AND LIFE SUPPORT (ECLS) TECHNOLOGIES, PART 2 [KANKYOU SEIGYO/SEIMEI IJI GIJUTSU NO CHOUSA KENTOU]
Tokyo, Japan 31 Mar. 1993 35 p In JAPANESE
(NASDA-CNT-930012-PT-2; JTN-93-80466-PT-2) Avail: CASI HC A03/MF A01

The survey and study on ECLS (Environmental Control and Life Support) technologies aiming at an ECLS to which the advanced technology at the present time is incorporated focusing on the air renewal technologies (such as removal of carbon dioxide, reduction of carbon dioxide, oxygen production, and toxic gas removal) and water recycle technologies (such as distillation and filtration) taking into the consideration a manned engineering test satellite (assuming the launch around 2000) is presented. The reference model establishment, recycling type ECLSS (Environmental Control and Life Support System) total system study, survey and study on subsystem technologies, planning of research and development projects, and visiting survey of ECLSS oriented facilities in and out of the country, and survey of the ECLSS related references is presented. An integrated research project for manned platform recycling type life support equipment is shown. Author (NASDA)

N94-13601* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-30 MAGELLAN IUS/EVA TRAINING IN WETF (Videotape)
Apr. 1989 Videotape: 11 min. playing time, in color, with sound
(NASA-TM-109300; NONP-VT-93-185315) Avail: CASI VHS A01/BETA A22

Astronauts Thagard and Lee suit up and enter the WETF to practice working the Magellan mockup in a zero-g environment. Author

N94-13611* National Aeronautics and Space Administration, Washington, DC.
NEW PROSTHETIC DEVICES (Videotape)
May 1991 Videotape: 3 min. 36 sec. playing time, in color, with sound
(NASA-TM-109304; NONP-VT-93-185322) Avail: CASI VHS A01/BETA A22

Using robotic techniques, NASA researchers have developed end-effectors designed to meet individual needs of hand and below the elbow amputees that are more efficient than the traditional hook. Author

N94-13615* National Aeronautics and Space Administration, Washington, DC.
RECYCLING IN SPACE (Videotape)
May 1991 Videotape: 3 min. 11 sec. playing time, in color, with sound
(NASA-TM-109307; NONP-VT-93-185325) Avail: CASI VHS A01/BETA A22

NASA's effort to provide a completely enclosed life support system that offers food and recycled air, water, and waste for long-duration space travel or settlements is explained. Author (revised)

N94-13674*# Foster-Miller Associates, Inc., Waltham, MA.
DEVELOPMENT OF A NONAZEOTROPIC HEAT PUMP FOR CREW HYGIENE WATER HEATING Final Report, Jun. 1989 - Aug. 1991
DAVID H. WALKER and GLENN I. DEMING Oct. 1991 98 p
(Contract NAS8-38407; SBIR-09.04-3200)
(NASA-CR-194189; NAS 1.26:194189; FM-9017-482) Avail: CASI HC A05/MF A02

A Phase 2 SBIR Program funded by the NASA Marshall Space Flight Center to develop a Nonazeotropic Heat Pump is described. The heat pump system which was designed, fabricated, and tested in the Foster-Miller laboratory, is capable of providing crew hygiene water heating for future manned missions. The heat pump utilizes a nonazeotropic refrigerant mixture which, in this application, provides a significant Coefficient of Performance improvement over a single-constituent working fluid. In order to take full advantage of the refrigerant mixture, compact tube-in-tube heat exchangers were designed. A high efficiency scroll compressor with a proprietary lubrication system was developed to meet the requirements of operation in zero-gravity. The prototype heat pump system consumes less than 200W of power compared to the alternative of electric cartridge heaters which would require 2 to 5 kW. Author (revised)

N94-13712*# Bionetics Corp., Cocoa Beach, FL.
BIOMASS PRODUCTION CHAMBER AIR ANALYSIS OF WHEAT STUDY (BWT931)
J. H. BATTEN, B. V. PETERSON, E. BERDIS, and E. M. WHEELER Aug. 1993 62 p
(Contract NAS10-11624)
(NASA-CR-194092; NAS 1.26:194092) Avail: CASI HC A04/MF A01

NASA's Controlled Ecological Life Support System (CELSS) biomass production chamber at John F. Kennedy Space Center provides a test bed for bioregenerative studies using plants to provide food, oxygen, carbon dioxide removal, and potable water to humans during long term space travel. Growing plants in enclosed environments has brought about concerns regarding the level of volatile organic compounds (VOC's) emitted from plants and the construction materials that make up the plant growth chambers. In such closed systems, the potential exists for some VOC's to reach toxic levels and lead to poor plant growth, plant death, or health problems for human inhabitants. This study characterized the air in an enclosed environment in which wheat cv. Yocora Rojo was grown. Ninty-four whole air samples were analyzed by gas chromatography/mass spectrometry throughout the eighty-four day planting. VOC emissions from plants and materials were characterized and quantified. Author (revised)

N94-13767*# National Aerospace Lab., Tokyo (Japan).
MANUAL CONTROL IN SPACE RESEARCH ON PERCEPTUAL-MOTOR FUNCTIONS UNDER ZERO GRAVITY CONDITIONS (L-10)
AKIRA TADA *in* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 185-187 Aug. 1993
Avail: CASI HC A01/MF A03

Are human abilities to control vehicles and other machines the same in space as those on Earth? The L-10 Manual Control Experiment of the First Materials Processing Tests (FMPT) started from this question. Suppose a pilot has the task to align the head of a space vehicle toward a target. His actions are to look at the target, to determine the vehicle movement, and to operate the manipulator. If the activity of the nervous system were the same as on Earth, the movements, of the eye and hand would become excessive because the muscles do not have to oppose gravity. The timing and amount of movement must be arranged for appropriate actions. The sensation of motion would also be affected by the loss of gravity because the mechanism of the otolith, the major acceleration sensor, depends on gravity. The possible instability of the sensation of direction may cause mistakes in the direction of control of manipulator movement. Thus, the experimental data can be used for designing man-machine systems in space, as well as for investigation of physiological mechanisms. In this experiment, the direction of vehicle heading is expressed by a light spot on an array of light emitting diodes and the manipulator is of a finger stick type. As the light spot moves up and down, the Japanese Payload Specialist, and the subject, must move the manipulator forward and backward to keep the movement of the light spot within the neighborhood of the central point of the display. The position of the light spot is computed in such a manner that when the stick is kept at the neutral position, a motion whose acceleration is proportional to the angle of deflection is added to the movement of the light spot. The Operator Describing Function, which is an expression of human control characteristics, can be calculated from 2 minutes of raw data of the light spot position and stick deflection. The 2 minutes of operation is called a run, and 8 runs with resting periods composes a session. The on-orbit experiment will be conducted on the second, fourth, and

seventh days. One session of experiment of each of these days is conducted following the L-4 experiment, which uses the same apparatus. The Payload Specialist, aided by a Mission Specialist, will take our apparatus from a rack container, set up the apparatus, attach electrodes for measurements of eye movement and muscle activity, conduct the L-4 Visual Stability Experiment, conduct one session of the manual control experiment, and then dissemble and stow the apparatus. In addition to the flight experiment, pre-flight and post-flight experiments will be conducted. The data of three sessions on orbit will reflect adaption of physiological systems to microgravity. The data of post-flight experiments, on the other hand, will reflect re-adaptation of physiological systems to the gravity condition on the ground. Control data collected with and without psychological tension will be scheduled just prior to and long before launch. Author (revised)

N94-13775*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
IN-FLIGHT DEMONSTRATION OF THE SPACE STATION FREEDOM HEALTH MAINTENANCE FACILITY FLUID THERAPY SYSTEM (E300/E05)
CHARLES W. LLOYD *In* NASA. Marshall Space Flight Center, Spacelab J Experiment Descriptions p 249-257 Aug. 1993
Avail: CASI HC A02/MF A03

The Space Station Freedom (SSF) Health Maintenance Facility (HMF) will provide medical care for crew members for up to 10 days. An integral part of the required medical care consists of providing intravenous infusion of fluids, electrolyte solutions, and nutrients to sustain an ill or injured crew member. In terrestrial health care facilities, intravenous solutions are normally stored in large quantities. However, due to the station's weight and volume constraints, an adequate supply of the required solutions cannot be carried onboard SSF. By formulating medical fluids onboard from concentrates and station water as needed, the Fluid Therapy System (FTS) eliminates weight and volume concerns regarding intravenous fluids. The first full-system demonstration of FTS is continuous microgravity will be conducted in Spacelab-Japan (SL-J). The FTS evaluation consists of two functional objectives and an in-flight demonstration of intravenous administration of fluids. The first is to make and store sterile water and IV solutions onboard the spacecraft. If intravenous fluids are to be produced in SSF, successful sterilization of water and reconstituting of IV solutions must be achieved. The second objective is to repeat the verification of the FTS infusion pump, which had been performed in Spacelab Life Sciences - 1 (SLS-1). during SLS-1, the FTS IV pump was operated in continuous microgravity for the first time. The pump functioned successfully, and valuable knowledge on its performance in continuous microgravity was obtained. Finally, the technique of starting an IF in microgravity will be demonstrated. The IV technique requires modifications in microgravity, such as use of restraints for equipment and crew members involved.
Author (revised)

N94-13901# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Thermal Control and Life Support Div.
LIFE SUPPORT AND HABITABILITY MANUAL, VOLUME 1
R. A. BINOT Aug. 1991 563 p
(ISSN 0379-4059)
(ESA-PSS-03-406-ISSUE-1-VOL-1; ETN-93-94406) Copyright
Avail: CASI HC A24/MF A04

This manual is designed to serve the needs of researchers and engineers working in the field of manned space programs and covers various aspects of life support and habitability. System needs are addressed and technologies associated with each of these systems are detailed by sets of data sheets that were designed to follow a standard format. The manual will be developed progressively and will be updated by issuing revised chapters and individual data sheets. It is offered to companies and research centers so that they may propose technical inputs to be used in the preparation of such updates. These inputs will be strictly technical, clear, complete, and will avoid any information of a commercial nature. In volume 1, requirements for life support, driving missions, and atmosphere revitalization are covered.
ESA

N94-13902# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Thermal Control and Life Support Div.
LIFE SUPPORT AND HABITABILITY MANUAL, VOLUME 2
R. A. BINOT Aug. 1991 557 p
(ISSN 0379-4059)
(ESA-PSS-03-406-ISSUE-1-VOL-2; ETN-93-94407) Copyright
Avail: CASI HC A24/MF A04

This manual is designed to serve the needs of researchers and engineers working in the field of manned space programs and covers various aspects of life support and habitability. System needs are addressed and technologies associated with each of these systems are detailed by sets of data sheets that were designed to follow a standard format. The manual will be developed progressively and will be updated by issuing revised chapters and individual data sheets. It is offered to companies and research centers so that they may propose technical inputs to be used in the preparation of such updates. These inputs will be strictly technical, clear, complete, and will avoid any information of a commercial nature. In volume 2, atmosphere supply and control, and temperature and humidity control are covered. Information on equivalent weight and the determination of weight penalties, and on qualitative assessment methods, is given. ESA

N94-13972# Civil Aeromedical Inst., Oklahoma City, OK.
AN ASSESSMENT OF THE POTENTIAL FOR NECK INJURY DUE TO PADDING OF AIRCRAFT INTERIOR WALLS FOR HEAD IMPACT PROTECTION Final Report
R. ARMENIA-COPE, J. H. MARCUS, R. V. GOWDY, and R. L. DEWEESE Aug. 1993 13 p
(DOT/FAA/AM-93/14) Avail: CASI HC A03/MF A01

This report describes a short test program to assess the potential for neck injury induced by padding on the interior walls of an aircraft cabin to reduce the possibility of a head injury during a crash. Such padding is a possible mechanism of achieving the heightened impact protection requirements adopted by the Federal Aviation Administration in 1988. The report reviews the literature on impact induced neck injury, and reports neck injury criteria developed and reported by others. The type of test device to use with the neck injury criteria is also discussed. Using the reported neck injury criteria, and a Hybrid 3 test dummy with neck instrumentation, the testing program found that neck injury, with one exception, was not likely in either the tested pad or unpadded case. The one exception was neck extension injuries for which both the unpadded and padded tests exceeded the injury criteria. The tested pad, in comparison to the unpadded case, substantially decreased the neck extension moment, implying a reduction in neck injury risk. Author (revised)

N94-13979*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
VALIDATED ENVIRONMENTAL AND PHYSIOLOGICAL DATA FROM THE CELSS BREADBOARD PROJECTS BIOMASS PRODUCTION CHAMBER. BW7931 (WHEAT CV. YECORA ROJO)
G. W. STUTTE (Bionetics Corp., Cocoa Beach, FL.), C. L. MACKOWIAK (Bionetics Corp., Cocoa Beach, FL.), G. A. MARKWELL (Bionetics Corp., Cocoa Beach, FL.), R. M. WHEELER, and J. C. SAGER Aug. 1993 9 p Revised
(Contract NAS10-11624)
(NASA-TM-109272; NAS 1.15:109272) Avail: CASI HC A02/MF A01

This KSC database is being made available to the scientific research community to facilitate the development of crop development models, to test monitoring and control strategies, and to identify environmental limitations in crop production systems. The KSC validated dataset consists of 17 parameters necessary to maintain bioregenerative life support functions: water purification, CO2 removal, O2 production, and biomass production. The data

are available on disk as either a DATABASE SUBSET (one week of 5-minute data) or DATABASE SUMMARY (daily averages of parameters). Online access to the VALIDATED DATABASE will be made available to institutions with specific programmatic requirements. Availability and access to the KSC validated database are subject to approval and limitations implicit in KSC computer security policies. Author (revised)

N94-14023# Galaxy Scientific Corp., Pleasantville, NJ.
HUMAN FACTORS IN AVIATION MAINTENANCE: PHASE 3, VOLUME 1 Final Interim Report, Feb. - Dec. 1992
Aug. 1993 161 p
(Contract DTFA01-92-Y-01005)
(DOT/FAA/AM-93/15) Avail: CASI HC A08/MF A02

The third phase of research on Human Factors in Aviation Maintenance continued to look at the human's role in the aviation maintenance system via investigations, demonstrations, and evaluations of the research program outputs. An evaluation of a computer-based training simulation for troubleshooting an airliner environmental control system and an evaluation of the aircraft maintenance visual environment are described. A job aid for Aviation Safety Inspectors is also reported on, along with an evaluation of pen computers considered for the job aid. Also described is research on the following: ergonomic factors related to posture and fatigue; identification of characteristics of personnel best suited for inspection-oriented jobs; redesign of work control cards; and visual inspection and training alternatives in aviation maintenance. Author (revised)

N94-14335# Oak Ridge National Lab., TN.
EYE-GAZE AND INTENT: APPLICATION IN 3D INTERFACE CONTROL
J. C. SCHRYVER and J. H. GOLDBERG (Pennsylvania State Univ., University Park.) 1993 7 p Presented at the 5th International Conference on Human-computer Interaction, Orlando, FL, 8-13 Aug. 1993
(Contract DE-AC05-84OR-21400)
(DE93-015210; CONF-9308124-1) Avail: CASI HC A02/MF A01

Computer interface control is typically accomplished with an input 'device' such as a keyboard, mouse, trackball, etc. An input device translates a users input actions, such as mouse clicks and key presses, into appropriate computer commands. To control the interface, the user must first convert intent into the syntax of the input device. A more natural means of computer control is possible when the computer can directly infer user intent, without need of intervening input devices. We describe an application of eye-gaze-contingent control of an interactive three-dimensional (3D) user interface. A salient feature of the user interface is natural input, with a heightened impression of controlling the computer directly by the mind. With this interface, input of rotation and translation are intuitive, whereas other abstract features, such as zoom, are more problematic to match with user intent. This paper describes successes with implementation to date and ongoing efforts to develop a more sophisticated intent inferencing methodology. DOE

N94-14451# Westinghouse Idaho Nuclear Co., Inc., Idaho Falls.
SHEAN (SIMPLIFIED HUMAN ERROR ANALYSIS CODE) AND AUTOMATED THERP
J. R. WILSON 1993 9 p Presented at the GOCO Database Meeting, Augusta, GA, 2-3 Feb. 1993
(Contract DE-AC07-84ID-12435)
(DE93-014904; WINCO-11908; CONF-9302122-1) Avail: CASI HC A02/MF A01

One of the most widely used human error analysis tools is THERP (Technique for Human Error Rate Prediction). Unfortunately, this tool has disadvantages. The Nuclear Regulatory Commission, realizing these drawbacks, commissioned Dr. Swain, the author of THERP, to create a simpler, more consistent tool for deriving human error rates. That effort produced the Accident Sequence Evaluation Program Human Reliability Analysis Procedure (ASEP), which is more conservative than THERP, but a valuable screening tool. ASEP involves answering simple questions about the scenario in question, and then looking up the appropriate human error rate in the indicated table (THERP also uses look-up tables, but four times as many). The advantages of ASEP are that human factors expertise is not required, and the training to use the method is minimal. Although not originally envisioned by Dr. Swain, the ASEP approach actually begs to be computerized. That WINCO did, calling the code SHEAN, for Simplified Human Error ANalysis. The code was done in TURBO Basic for IBM or IBM-compatible MS-DOS, for fast execution. WINCO is now in the process of comparing this code against THERP for various scenarios. A discussion of SHEAN is reported. DOE

N94-14648*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COMPUTATIONAL CONTROL WORKSTATION: USERS' PERSPECTIVES
CARLOS M. ROITHMAYR, TIMOTHY M. STRAUBE (Colorado Univ., Boulder.), and JEFFREY S. TAVE (Lockheed Engineering and Sciences Co., Houston, TX.) *In* JPL, Proceedings of the Fifth NASA/NSF/DOD Workshop on Aerospace Computational Control p 491-505 15 Feb. 1993
Avail: CASI HC A03/MF A04

A Workstation has been designed and constructed for rapidly simulating motions of rigid and elastic multibody systems. We examine the Workstation from the point of view of analysts who use the machine in an industrial setting. Two aspects of the device distinguish it from other simulation programs. First, one uses a series of windows and menus on a computer terminal, together with a keyboard and mouse, to provide a mathematical and geometrical description of the system under consideration. The second hallmark is a facility for animating simulation results. An assessment of the amount of effort required to numerically describe a system to the Workstation is made by comparing the process to that used with other multibody software. The apparatus for displaying results as a motion picture is critiqued as well. In an effort to establish confidence in the algorithms that derive, encode, and solve equations of motion, simulation results from the Workstation are compared to answers obtained with other multibody programs. Our study includes measurements of computational speed. Author

N94-14790* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-35 EVA PAYLOAD TRAINING IN WETF (Videotape)
Apr. 1990 Videotape: 11 min. playing time, in color, with sound
(NASA-TM-109492; NONP-VT-93-190289) Avail: CASI VHS A01/BETA A22

Footage showing astronauts Lounge and Hoffman donning EVA suits while astronaut Durrance watches is presented. The footage also shows Lounge and Hoffman working on an ASTRO-1 mockup in the WETF. Author (revised)

N94-15194* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-35 CREW TRAINING: EMU WALK THROUGH AND EVA PREP AND POST (Videotape)
Apr. 1990 Videotape: 12 min. 30 sec. playing time, in color, with sound
(NASA-TM-109488; NONP-VT-93-190285) Avail: CASI VHS A01/BETA A22

This video tape shows astronauts Hoffman, Gardner, and Lounge donning the Extravehicular Mobility Unit (EMU) and performing checks on the system. CASI

N94-15195* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-35 CREW TRAINING: BAILOUT IN CCT, FIREFIGHTING, TAGS CLASS AND BAILOUT IN WFTF (Videotape)
Apr. 1990 Videotape: 30 min. playing time, in color, with sound
(NASA-TM-109489; NONP-VT-93-190286) Avail: CASI VHS A01/BETA A22

Several aspects of crew training are shown including bailout

exercises from the CCT and in the Weightless Environment Training Facility. CASI

N94-15224* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BROWN, MARK (Videotape)
Jul. 1989 Videotape: 8 min. 20 sec. playing time, in color, with sound
(NASA-TM-109505; NONP-VT-93-190302) Avail: CASI VHS A01/BETA A22
Mark Brown is shown during ASCAN training programs including parachute and classroom instruction. CASI

N94-15285* National Aeronautics and Space Administration, Washington, DC.
SUPPORTING LIFE IN SPACE (Videotape)
Apr. 1989 Videotape: 3 min. 45 sec. playing time, in color, with sound
(NASA-TM-109593; NONP-VT-93-190391) Avail: CASI VHS A01/BETA A22
This videotape examines NASA research regarding the growing of plants for food during long-duration space travel. The primary focus is on the Controlled Ecological Life Support System (CELLS). CASI

N94-15286* National Aeronautics and Space Administration, Washington, DC.
ANCIENT SKILLS: MODERN USE (Videotape)
Nov. 1988 Videotape: 2 min. 42 sec. playing time, in color, with sound
(NASA-TM-109594; NONP-VT-93-190392) Avail: CASI VHS A01/BETA A22
This videotape shows how Navajo Indians are involved in making the spacesuits of the future. CASI

N94-15303* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-30 EVA PREP IN CCT: GRABE, LEE, AND THAGARD (Videotape)
Apr. 1989 Videotape: 5 min. playing time, in color, with sound
(NASA-TM-109572; NONP-VT-93-190370) Avail: CASI VHS A01/BETA A22
Astronauts Grabe, Thagard, and Lee practice donning extravehicular activity (EVA) suits while in the CCT. CASI

N94-15305* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-29 PRE-LAUNCH AND POST-LANDING EGRESS (Videotape)
Mar. 1989 Videotape: 18 min. 10 sec. playing time, in color, with sound
(NASA-TM-109574; NONP-VT-93-190372) Avail: CASI VHS A01/BETA A22
This video shows crew emergency egress training. It includes practice after being hoisted to the ceiling and descending a rope. CASI

N94-15330* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-37 CETA EVALUATION WITH ROSS (Videotape)
Jul. 1990 Videotape: 5 min. 25 sec. playing time, in color, with sound
(NASA-TM-109495; NONP-VT-93-190292) Avail: CASI VHS A01/BETA A22
This video shows Astronaut Ross donning an EVA suit and performing various tasks on the Crew and Equipment Translation Aide (CETA) equipment. CASI

N94-15359* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-34 FINAL BENCH REVIEW (Videotape)
Oct. 1989 Videotape: 14 min. playing time, in color, with sound
(NASA-TM-109464; NONP-VT-93-190261) Avail: CASI VHS A01/BETA A22
The Space Shuttle crew is shown looking through equipment they will carry into orbit, including clothing, personal effects, and camera. CASI

N94-15360* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-34 CREW BAILOUT EXERCISE IN CCT (Videotape)
Aug. 1989 Videotape: 10 min. 40 sec. playing time, in color, with sound
(NASA-TM-109465; NONP-VT-93-190262) Avail: CASI VHS A01/BETA A22
This video shows crews practicing bailout procedures in the CCT. CASI

N94-15361* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-34 CHANG-DIAZ AND E. BAKER DURING GALILEO CONTINGENCY TRAINING IN WFTF (Videotape)
Sep. 1989 Videotape: 16 min. 15 sec. playing time, in color, with sound
(NASA-TM-109466; NONP-VT-93-190263) Avail: CASI VHS A01/BETA A22
Chang-Diaz and Baker are shown donning suits for submersion in the Weightless Environment Training Facility (WETF). Once in the water, they work on the Galileo mockup. CASI

N94-15362* National Aeronautics and Space Administration, Washington, DC.
FIREFIGHTERS BREATHING SYSTEM (Videotape)
Apr. 1989 Videotape: 2 min. 50 sec. playing time, in color, with sound
(NASA-TM-109611; NONP-VT-93-190409) Avail: CASI VHS A01/BETA A22
The improvement of protective gear for fire fighters is presented, including the breathing system. CASI

N94-15371* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INTERNATIONAL FOOD RESEARCH PROJECT (Videotape)
Oct. 1989 Videotape: 5 min. 30 sec. playing time, in color, with sound
(NASA-TM-109540; NONP-VT-93-190339) Avail: CASI VHS A01/BETA A22
Dr. Selina Ahmed, an associate professor of Human Nutrition, explains the purpose of the International Food Research Project to food tasters. CASI

N94-15375* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-29 EVA PREP IN FFT (Videotape)
Jan. 1989 Videotape: 11 min. playing time, in color, with sound
(NASA-TM-109544; NONP-VT-93-190341) Avail: CASI VHS A01/BETA A22
Astronauts Blaha, Springer, and Bagian are shown donning suits in the FFT. Blaha runs through checklists while the other two suit up in the airlock. CASI

N94-15377* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-32 LDEF EVA TRAINING IN WETF WITH LOW AND DUNBAR (Videotape)
Nov. 1989 Videotape: 14 min. playing time, in color, with sound
(NASA-TM-109473; NONP-VT-93-190270) Avail: CASI VHS A01/BETA A22
Astronauts Low and Dunbar are shown entering the Weightless Environment Training Facility to perform tasks they might be called on to do if extravehicular activity were required during their mission to retrieve the Long Duration Exposure Facility. CASI

N94-15382* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-29 CREW FOOD TASTING IN BUILDING 45 (Videotape)
Jan. 1989 Videotape: 3 min. 28 sec. playing time, in color, with

sound
(NASA-TM-109547; NONP-VT-93-190345) Avail: CASI VHS A01/BETA A22

The crew is shown tasting food that will be served on the Space Shuttle. CASI

N94-15383* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-32 BAILOUT TRAINING IN WETF (Videotape)
Dec. 1989 Videotape: 13 min. playing time, in color, with sound
(NASA-TM-109476; NONP-VT-93-190273) Avail: CASI VHS A01/BETA A22

The crew is shown practicing water survival techniques in the Weightless Environment Training Facility in case of a bailout during the launch or landing. CASI

N94-15385* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-29 CREW BAILOUT IN WETF (Videotape)
Feb. 1989 Videotape: 7 min. 30 sec. playing time, in color, with sound
(NASA-TM-109548; NONP-VT-93-190346) Avail: CASI VHS A01/BETA A22

The crew is donning life vests and being dropped into the WETF. Once in the water, the crew is trained on water survival techniques. CASI

N94-15387* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-28 ADAMSON AND BROWN EMU WALK THROUGH (Videotape)
Jul. 1989 Videotape: 10 min. playing time, in color, with sound
(NASA-TM-109549; NONP-VT-93-190347) Avail: CASI VHS A01/BETA A22

Astronauts Adamson and Brown are shown working on EMU suit, donning EVA gear, and entering vacuum chamber. CASI

N94-15388* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-33 EMERGENCY EGRESS TRAINING (Videotape)
Nov. 1989 Videotape: 15 min. playing time, in color, with sound
(NASA-TM-109525; NONP-VT-93-190322) Avail: CASI VHS A01/BETA A22

The STS-33 crew is shown donning flight survival gear, then entering the CCT for bailout exercises. After completion of the exercises in the CCT, the bailout procedures are practiced in the FFT. CASI

N94-15390* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
1990 ASCAN LAND SURVIVAL TRAINING (Videotape)
Feb. 1991 Videotape: 32 min. playing time, in color, with sound
(NASA-TM-109527; NONP-VT-93-190324) Avail: CASI VHS A01/BETA A22

This video tape shows astronaut candidate training at Fairchild AFB with signal flares, setting up tents, making fires, fishing, and signaling a helicopter with mirrors and radios. CASI

N94-15391* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
1990 ASCAN GROUND EGRESS/PARASAIL (Videotape)
Feb. 1991 Videotape: 32 min. playing time, in color, with sound
(NASA-TM-109528; NONP-VT-93-190325) Avail: CASI VHS A01/BETA A22

This video tape shows astronaut candidates practicing ground egress and parachute landing procedures. CASI

N94-15392* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CREW ESCAPE CERTIFICATION TEST (Videotape)
Aug. 1988 Videotape: 2 min. 50 sec. playing time, in color, with sound
(NASA-TM-109530; NONP-VT-93-190327) Avail: CASI VHS A01/BETA A22

This video tape shows the Shuttle hatch jettison test at Rockwell facilities. The video also shows a Shuttle escape pole deployment test from a NASA aircraft, and an emergency egress test performed by a volunteer Navy parachutist using the pole and a parachute escape system. CASI

N94-15401* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-27 EMU AND RMS CONTINGENCY TRAINING (Videotape)
Dec. 1988 Videotape: 23 min. playing time, in color, with sound
(NASA-TM-109550; NONP-VT-93-190348) Avail: CASI VHS A01/BETA A22

This video shows astronauts donning their EMU suits and Astronauts Shepard and Ross training in the WETF on the RMS, which will not come down. CASI

N94-15402* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-33 CARTER AND THORTON DURING WETF ACTIVITIES (Videotape)
Nov. 1989 Videotape: 8 min. 54 sec. playing time, in color, with sound
(NASA-TM-109471; NONP-VT-93-190268) Avail: CASI VHS A01/BETA A22

Astronauts Carter and Thorton are shown suiting up for work in the WETF (Weightless Environment Training Facility). (The payload mockup shown is not related to the STS-33 mission. It is a mockup of the Upper Atmosphere Research Satellite (UARS), which is scheduled to fly in the early 1990's.) CASI

N94-15404* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-27 CREW POST-INSERTION DEORBIT-PREP IN CCT (Videotape)
Nov. 1988 Videotape: 14 min. playing time, in color, with sound
(NASA-TM-109552; NONP-VT-93-190350) Avail: CASI VHS A01/BETA A22

The crew is shown donning harness backpacks and suits for post-insertion activities in the CCT. Once on the CCT middeck, astronauts take off suits and practice stowing seats. CASI

N94-15406* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-27 CREW FIRE TRAINING AND GLOVE MOLDING (Videotape)
Nov. 1988 Videotape: 14 min. 30 sec. playing time, in color, with sound
(NASA-TM-109554; NONP-VT-93-190352) Avail: CASI VHS A01/BETA A22

The crew is shown during fire training exercises and space suit glove molding. CASI

N94-15435* National Aeronautics and Space Administration, Washington, DC.
FOOD FOR SPACE (Videotape)
Jan. 1985 Videotape: 3 min. 20 sec. playing time, in color, with sound
(NASA-TM-109668; NONP-VT-93-190466) Avail: CASI VHS A01/BETA A22

This video explores the food preparation and selection over the years of space flight. CASI

N94-15441* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-31 HUBBLE SPACE TELESCOPE CONTINGENCY TRAINING IN WETF WITH MCCANDLESS AND SULLIVAN (Videotape)
Feb. 1989 Videotape: 13 min. playing time, in color, with sound
(NASA-TM-109480; NONP-VT-93-190277) Avail: CASI VHS A01/BETA A22

Astronauts McCandless adn Sullivan are shown suiting up for training with a telescope mockup in the Weightless Environment Training Facility (WETF). CASI

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N94-15453* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-38 CREW TRAINING: HABITATION EQUIPMENT PROCEDURES, BAILOUT IN CCT, 70MM PHOTO CLASS, EVA PREP AND POST, AND FIREFIGHTING (Videotape)
Jul. 1990 Videotape: 20 min. playing time, in color, with sound
(NASA-TM-109494; NONP-VT-93-190291) Avail: CASI VHS A01/BETA A22

Several aspects of crew training are shown, including habitation equipment procedures and bailout procedures (both in CCT), 70mm photo class, EVA prep and post, and firefighting.
Author (revised)

N94-15454* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ADAMSON, JIM (Videotape)
Jul. 1989 Videotape: 11 min. 34 sec. playing time, in color, with sound
(NASA-TM-109507; NONP-VT-93-190304) Avail: CASI VHS A01/BETA A22

Jim Adamson is shown during ASCAN training programs including T-38 training, parachute and liferaft training, and classroom instruction.
CASI

N94-15460* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-37 ASTRONAUTS ROSS AND APT DURING CETA HARDWARE CHECKOUT (Videotape)
Mar. 1990 Videotape: 7 min. 15 sec. playing time, in color, with sound
(NASA-TM-109496; NONP-VT-93-190293) Avail: CASI VHS A01/BETA A22

Astronauts Ross and Apt are shown checking out Crew and Equipment Translation Aide (CETA) equipment.
CASI

N94-15462* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-36 CREW EVA PREP AND POST-TRAINING, BAILOUT EXERCISES, FINAL BENCH REVIEW (Videotape)
Feb. 1990 Videotape: 14 min. 30 sec. playing time, in color, with sound
(NASA-TM-109498; NONP-VT-93-190295) Avail: CASI VHS A01/BETA A22

The crew is shown in the CCT airlock checking out EVA equipment and practicing bailout exercises. They are also shown looking over equipment they will carry into space including medical equipment, clothing, and cameras.
CASI

N94-15470* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-26 CREW CLOTHING, GLOVE MOLDING, AND PERSONAL HYGIENE (Videotape)
Jul. 1988 Videotape: 19 min. 41 sec. playing time, in color, with sound
(NASA-TM-109520; NONP-VT-93-190317) Avail: CASI VHS A01/BETA A22

This videotape shows the crew during various phases of flight clothing fit checks, space suit glove molding, and selection of personal hygiene articles for use onboard the Shuttle.
CASI

N94-15507* National Aeronautics and Space Administration, Washington, DC.
SPACE SUIT DESIGN (Videotape)
Jun. 1987 Videotape: 3 min. 48 sec. playing time, in color, with sound
(NASA-TM-109670; NONP-VT-93-190468) Avail: CASI VHS A01/BETA A22

This video shows how space suits evolved to those being designed for the Space Station Freedom.
CASI

N94-15514* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MARK 111 SUIT TEST EVALUATION IN WETF WITH JERRY ROSS (Videotape)
Oct. 1989 Videotape: 7 min. 50 sec. playing time, in color, with sound
(NASA-TM-109504; NONP-VT-93-190301) Avail: CASI VHS A01/BETA A22

Astronaut Jerry Ross tests the new Mark 111 spacesuit in the WETF. The Mark 111 could be used as the main spacesuit on the Space Station Freedom.
CASI

N94-15717*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INVESTIGATION OF THE EFFECTS OF EXTRAVEHICULAR ACTIVITY (EVA) GLOVES ON PERFORMANCE
RAM R. BISHU (Nebraska Univ., Lincoln.) and GLENN KLUTE Oct. 1993 49 p
(NASA-TP-3401; S-732; NAS 1.60:3401) Avail: CASI HC A03/MF A01

The objective was to assess the effects of extravehicular activity (EVA) gloves at different pressures on human hand capabilities. A factorial experiment was performed in which three types of EVA gloves were tested at five pressure differentials. The independent variables tested in this experiment were gender, glove type, pressure differential, and glove make. Six subjects participated in an experiment where a number of dexterity measures, namely time to tie a rope, and the time to assemble a nut and bolt were recorded. Tactility was measured through a two point discrimination test. The results indicate that with EVA gloves strength is reduced by nearly 50 percent, there is a considerable reduction in dexterity, performance decrements increase with increasing pressure differential, and some interesting gender glove interactions were observed, some of which may have been due to the extent (or lack of) fit of the glove to the hand. The implications for the designer are discussed.
Author (revised)

N94-15820# Dayton Univ., OH. Research Inst.
COMPARATIVE NIGHT VISION GOGGLE VISUAL ACUITY MEASUREMENTS PERFORMED IN THE A-10 AIRCRAFT IN AN OPERATIONAL SETTING Final Report, Apr. - Sep. 1992
CARITA A. DEVILBISS and JOSEPH C. ANTONIO Apr. 1993 29 p
(Contract F33615-90-C-0005)
(AD-A266721; AL/HR-TR-1993-0066) Avail: CASI HC A03/MF A01

The Night Vision Programs Office of the Aircrew Training Research Division, Armstrong Laboratory, responded to a request from the 422nd Operational Test Squadron at Nellis AFB to conduct the ground testing portion of their A-10 Night Vision Goggle (NVG) special project. Evaluations were conducted comparing the performance of four different NVG's under both laboratory and representative operational conditions. The performance of the F4949 'Super ANVIS' was superior to that of the other NVG's tested. Additionally, a comparative study was conducted evaluating the impact of two different windscreens on NVG image quality. The new windscreen allowed the transmission of more energy usable to the NVG's, thus enhancing image quality over that possible with the old windscreen.
DTIC

N94-15883*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INFLATABLE RESCUE DEVICE Patent Application
SCOTT A. SWAN, inventor (to NASA) 4 May 1993 21 p
(NASA-CASE-MSC-22244-1; NAS 1.71:MSC-22244-1; US-PATENT-APPL-SN-066274) Avail: CASI HC A03/MF A01

This invention discloses, in one aspect, a personal rescue device for use in outer space which has an inflatable flexible tube with a shaper apparatus herein. Gas under pressure flows through the shaper apparatus and into the flexible tube. The flexible tube is mounted to the shaper so that as it inflates it expands and deploys lengthwise away from the shaper. In one embodiment a housing contains the shaper and the flexible tube and the housing is designed to facilitate movement of the expanding tube from the housing so the expanding tube does not bunch up in the housing.
NASA

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N94-16093 York Univ. (Ontario). Human Performance Lab.
CHARACTERISTICS OF AIMED ARM MOVEMENTS IN HUMANS UNDER LOW GRAVITY
C. BOCK, K. ARNOLD, I. HOWARD, and K. MONEY *In* National Research Council Canada, Proceedings of the Second Workshop on Microgravity Experimentation 3 p 1990
Avail: Issuing Activity (National Research Council, Publication Sales and Distribution, Montreal Road, Ottawa, Ontario, K1A OR6 Canada)

A study was conducted to investigate the accuracy of arm pointing movements in human subjects without visual feedback on the pointing arm during low-gravity episodes of KC-135 flights, in order to gather new information on errors of visual localization and of movement execution in space. The experimental setup involved pointing at the face of a digitizing pad mounted on the back of a computer screen that provided the pointing target and faced the human subject. The time between target appearance and movement onset (reaction time), movement duration, movement velocity, and absolute pointing errors were recorded. A clear tendency was found to point too high or low in the first movement of each low-gravity episode, and to reduce these pointing errors during subsequent movements. No changes in movement kinematics between low-gravity and normal gravity were observed. Author (CISTI)

N94-16108# Memphis State Univ., TN. Dept. of Psychology.
QUESTIONING MECHANISMS DURING TUTORING, CONVERSATION, AND HUMAN-COMPUTER INTERACTION Final Report, 15 Jun. 1992 - 14 Jun. 1993
ARTHUR C. GRAESSER Jun. 1993 51 p
(Contract N00014-92-J-1826)
(AD-A266199; ONR-TR-93-1) Avail: CASI HC A04/MF A01

One-to-one tutoring is more effective than alternative training methods, yet there have been few attempts to examine the process of naturalistic tutoring. This project explored dialogue patterns in two corpora: graduate students tutoring undergraduates in research methods; and high school students tutoring 7th graders in algebra. We analyzed pedagogical strategies, feedback mechanisms, question asking, question answering, and pragmatic assumptions during the tutoring process. One pervasive dialogue pattern was a five-step frame: (1) tutor asks question, (2) student answers question, (3) tutor gives short feedback on answer quality, (4) tutor and student collaboratively improve on answer quality, and (5) tutor assesses the student's understanding of the answer. Tutor questions were primarily motivated by curriculum scripts and the process of coaching students through exemplar problems--rarely by attempts to diagnose and remediate the student's idiosyncratic knowledge deficits. Dialogue patterns were simulated by two computational models: a recurrent connectionist network, and a recursive transition network. These models capture the systematicity in the sequential ordering of speech act categories. That is, to what extent does a model accurately predict the category of speech act N+1, given speech acts 1 through N? DTIC

N94-16612*# Georgia Inst. of Tech., Atlanta.
ERGONOMICS IN THE OFFICE ENVIRONMENT
THEODORE K. COURTNEY *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 45-60 Jul. 1993
Avail: CASI HC A03/MF A03

Perhaps the four most popular 'ergonomic' office culprits are: (1) the computer or visual display terminal (VDT); (2) the office chair; (3) the workstation; and (4) other automated equipment such as the facsimile machine, photocopier, etc. Among the ergonomics issues in the office environment are visual fatigue, musculoskeletal disorders, and radiation/electromagnetic (VLF,ELF) field exposure from VDT's. We address each of these in turn and then review some regulatory considerations regarding such stressors in the office and general industrial environment. Author

N94-16621*# National Health Services, Inc., New York, NY.
THE GODDARD SPACE FLIGHT CENTER ERGONOMICS PROGRAM
EILEEN BATSON and THEODORE UNITE *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 153-158 Jul. 1993
Avail: CASI HC A02/MF A03

Since the Kennedy Space Center (KSC) Cardiovascular Screening Program started in 1984, we have made many changes to accommodate the growing number of participants. As a result of these changes, screening of KSC employees has become more efficient and productive. Various aspects of the program are covered. Derived from text

N94-16793 Analysis and Technology, Inc., New London, CT.
EVALUATION OF NIGHT VISION GOGGLES (NVG) FOR MARITIME SEARCH AND RESCUE (HH-3/HH-60) COMPARISON REPORT Final Report, Mar. 1989 - Jan. 1993
R. Q. ROBE and J. V. PLOURDE Jan. 1993 97 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DTCG39-89-C-E10G56)
(AD-A266493; USCG-D-09-93) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Eight experiments, including seven involving helicopters, have been conducted by the U.S. Coast Guard Research and Development (R and D) Center to evaluate night vision goggles (NVG's) for their effectiveness in detecting small targets at night. Three types of NVG's have been evaluated. The AN/AVS-6 Aviator's Night Vision Imaging System (ANVIS) was evaluated onboard U.S. Coast Guard HH-3F, CH-3E, and HH-60J helicopters and HU-25C and RG-8A fixed-wing aircraft. The AN/PVS-5C and AN/PVS-7A NVG's were evaluated onboard U.S. and Canadian Coast Guard Search and Rescue Units (SRU's) in the 200-foot size range and onboard U.S. Coast Guard 41-foot utility boats (UTB's). A total of 3029 target detection opportunities were generated during searches from helicopters for all the target types employed during the eight experiments. These data were first analyzed to determine whether a statistically significant difference existed in the detection performance of the HH-3/CH-3 and HH-60 helicopters. The data were then analyzed to determine which of 25 search parameters of interest exerted a statistically significant influence on target detection probability. Lateral range curves and sweep width estimates are presented for SRU/target type combinations that contained sufficient data to support this detailed analysis. Human factors data are presented and discussed. DTIC

N94-16983# Krug Life Sciences, Inc., San Antonio, TX.
REGULATED EMERGENCY OXYGEN SYSTEM Final Report, Jan. 1990 - Jan. 1991
NANCY J. BALKUS, EDWARD W. HADE, and JOHN H. OHLHAUSEN Jun. 1993 31 p
(Contract F33615-89-C-0603)
(AD-A266228; AL-TP-1992-0041) Avail: CASI HC A03/MF A01

This paper describes the accomplishments of the Regulated Emergency, Oxygen System (REOS) task. A true emergency secondary oxygen system is nonexistent in current aircraft. The current system is inadequate in regulating pressure, is ineffective at altitudes below 10,000 ft, and provides no option except to activate the emergency oxygen bottle if a malfunction of the primary regulator occurs. The REOS concept alleviates these inadequacies by providing an option to select a secondary regulated oxygen source, rather than the emergency bottle, if there is a malfunction of the primary regulator. Also of significance is that altitude protection has been incorporated into the REOS. The contents of this paper provide greater details as to the background, development, and testing of the REOS. DTIC

N94-17077# Anacapa Sciences, Inc., Fort Rucker, AL.
PRELIMINARY VALIDATION OF THE TASK ANALYSIS/WORKLOAD METHODOLOGY Interim Report, Jul. 1990 - Dec. 1991
DAVID B. HAMILTON and KENNETH D. CROSS Jun. 1993 147 p

(AD-A267514; AS1690-353-92; ARI-93-18) Avail: CASI HC A07/MF A02

Over the past 8 years, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has sponsored the development of the Task Analysis/Workload (TAWL) methodology. The methodology is used to develop computer-based models that predict the operator workload of Army weapon systems. The TAWL methodology has been used to predict operator workload in existing and modified versions of the AH-64, UH-60, and CH-47 aircraft. This preliminary research was designed to assess the validity of the methodology. Seven experimental task conditions, analogous to rotorcraft operation and designed to vary in workload, were used in the research. Two TAWL workload prediction models of the conditions were independently developed by two analysts. Twenty AH-64A aviators performed repeated trials in each of the task conditions. Measures of the aviators' task performance, subjective workload, and physiological workload were obtained as TAWL model validity criteria. Although there were some differences between the models developed by the two analysts, the predictions generated by the models were highly correlated. In addition, the correlations between the average TAWL predictions for both models and the criterion measures were significant and high (between .89 and .99). The results support the validity of the TAWL methodology. DTIC

N94-17452*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

STRATEGY FOR THE REDUCTION OF TOTAL INTEGRATED FLUID LOGISTICS TO THE SPACE STATION FREEDOM

MARSTON J. GOULD and DAVID T. SHANNON, JR. Nov. 1993 66 p

(Contract RTOP 476-14-06)

(NASA-TM-107744; NAS 1.15:107744) Avail: CASI HC A04/MF A01

The use of an integrated environmental control and life support system (ECLSS) and secondary propulsion system (SRS) on the Space Station Freedom (SSF) has many potential advantages. Through the metabolism of food, the crew on-board the station will produce carbon dioxide as a waste gas and an excess of water in the form of urine and condensate. The processing of these waste fluids by the ECLSS could produce quantities of oxygen that would eliminate the need for cryogenic oxygen resupply and hydrogen, carbon dioxide, and/or methane that could be used with the addition of a resistojet system to provide a constant low thrust for station. This additional thrust would represent significant savings in required hydrazine resupply. Author

N94-17460 Science Applications International Corp., McLean, VA.

PREDICTING RADIATION INDUCED PERFORMANCE DECREMENTS OF AH-1 HELICOPTER CREWS. VOLUME 1: PREDICTED VEERSUS ACTUAL PERFORMANCE OF AH-1 CREWS INDUCED WITH SYMPTOMS SIMULATING RADIATION SICKNESS Technical Report, 25 Sep. 1986 - 30 Nov. 1991

VAUGHN W. INMAN, WILLIAM A. PEREZ, JOSEPH I. PETERS, ROBERT R. SANCHEZ, and ROBERT W. YOUNG 1 Jul. 1993 213 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract DNA001-86-C-0308)

(AD-A268376; DNA-TR-92-54-VOL-1) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The purpose of this study was to assess the utility of the Performance Decrement Questionnaire (PDO) technique for prediction of radiation induced performance decrements in Army personnel. Twenty AH-1 pilots participated in an experiment in which they (1) predicted the effects of various symptom complexes on their performance, (2) went through a 36-hour protocol to induce symptoms similar to those that are followed by intermediate doses of radiation exposure, and (3) performed a simulated AH-1 mission before and after symptom induction. The participants' performance time predictions were compared to actual performance times. The comparisons between predicted and actual performance were conducted with correlational and modeling (MicroSAINT) techniques. The modeling analysis suggested greater concordance between predicted and actual performance than did the correlational analysis. DTIC

N94-17475 Air Force Inst. of Tech., Wright-Patterson AFB, OH.

COMPUTER-HUMAN INTERFACE ISSUES: THEORY AND APPLICATION M.S. Thesis

MICHAEL JOSEPH 11 May 1993 71 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A268013; AFIT/CI/CIA-93-117) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This paper addresses the process by which an organization implements a human-machine interface and what factors need to be considered to insure that the interface meets the needs of its human users. This latter goal is composed of objectives such as acceptance of the interface by the computer users, providing an acceptable means of assisting the human in accomplishing his/her computer assisted task, and related interface characteristics which help support these other two objectives. DTIC

N94-17563 Krug International, San Antonio, TX.

AIRCREW/GROUNDCREW LIFE SUPPORT SYSTEMS RESEARCH. VOLUME 1: CLIN 0001 RESEARCH REQUIREMENTS Final Report, May 1989 - Nov. 1992

ROBERT W. KRUTZ, JR. and JAMES T. WEBB Jul. 1993 50 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F33615-89-C-0603)

(AD-A268229; AL-TR-1993-0012-VOL-1) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

USAF Contract F33615-89-C-0603 (SOW Section 3.2; CLIN 0001) with KRUG Life Sciences, Incorporated, San Antonio Division, supported the Armstrong Laboratory by providing for research in the following areas: human research subjects; experimental life support equipment development laboratory; anti-G suit research, development, test, and evaluation (RDT&E); research databases; sub-atmospheric research; molecular sieve technology; centrifuge testing of life support equipment; centrifuge support; cockpit integration and crew performance; and spatial disorientation research. This final report provides summaries of objectives and accomplishments including citations and abstracts for the publications documenting the work. AL-TR-1993- 0012-VOL-2 is the final report for the CLIN 0002 portion of this contract. DTIC

N94-17564 Krug Life Sciences, Inc., San Antonio, TX.

AIRCREW/GROUNDCREW LIFE SUPPORT SYSTEMS RESEARCH. VOLUME 2: CLIN 0002 TASK ORDER REQUIREMENTS Final Report, May 1989 - Nov. 1992

JAMES T. WEBB and ROBERT W. KRUTZ, JR. Jul. 1993 45 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F33615-89-C-0603)

(AD-A268230; AL-TR-1993-0012-VOL-2) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

USAF Contract F33615-89-C-0603 (SOW Section 3.3; CLIN 0002) with KRUG Life Sciences, Incorporated, San Antonio Division, supported the Armstrong Laboratory by providing for research in the form of professional and technical personnel, resources, and, when required, facilities necessary to accomplish task orders for research, development, test, and evaluation (RDT&E) to include, but not be limited to, the following topics: chemical defense, experimental aeromedical and casualty care equipment laboratory support, biochemical laboratory support, test studies and evaluations, system integration/equipment modification, equipment design package, independent engineering tests, equipment fabrication, design and development, computer programs, specialized and unique R&D laboratory facilities, and altitude research. This final report provides summaries of objectives and accomplishments including citations and abstracts for the publications documenting the work. AL-TR-19930012-VOL-I is the final report for the CLIN 0001 portion of this contract. DTIC

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N94-17653*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
FORCE-ENDURANCE CAPABILITIES OF EXTRAVEHICULAR ACTIVITY (EVA) GLOVES AT DIFFERENT PRESSURE LEVELS
RAM R. BISHU (Nebraska Wesleyan Univ., Lincoln.) and GLENN K. KLUTE 1 Dec. 1993 13 p
(NASA-TP-3420; S-746; NAS 1.60:3420) Avail: CASI HC A03/MF A01

The human hand is a very useful multipurpose tool in all environments. However, performance capabilities are compromised considerably when gloves are donned. This is especially true to extravehicular activity (EVA) gloves. The primary intent was to answer the question of how long a person can perform tasks requiring certain levels of exertion. The objective was to develop grip force-endurance relations. Six subjects participated in a factorial experiment involving three hand conditions, three pressure differentials, and four levels of force exertion. The results indicate that, while the force that could be exerted depended on the glove, pressure differential, and the level of exertion, the endurance time at any exertion level depended just on the level of exertion expressed as a percentage of maximum exertion possible at that condition. The impact of these findings for practitioners as well as theoreticians is discussed. Author

N94-17841# Technical Research Associates, Salt Lake City, UT.
MAGNETOSTRICTIVE ACTUATORS FOR HUMAN SENSORY FEEDBACK Final Report, Jul. 1992 - Jan. 1993
OWEN D. BRIMHALL, DANIEL KNOWLTON, and HOWARD R. CURTIN Feb. 1993 37 p
(Contract F41624-92-C-6005)
(AD-A269266; AL/CF-TR-1993-0074) Avail: CASI HC A03/MF A01

The development of actuators with enhanced capabilities is critical to the achievement of sensory feedback systems for intuitive, real time human operation of telerobotic systems. The objective of this research project was to demonstrate feasibility of new actuators using active materials which will enhance the capabilities of dexterous, exoskeletal feedback systems for telerobotic applications. In phase 1, feasibility of several novel Terfenol-D magnetostrictive actuators were demonstrated. Several prototype actuators were fabricated and tested, including resistive single axis brakes, resistive multiaxis (ball) brake joints, and linear motors. The new actuators are relatively efficient, responsive, small and exert high forces. The actuators provide proportional forces and are easily interfaced with digital electronics. Several of the actuators were integrated into a simple demonstration board. Phase 2 will pursue advanced development of proportional force resistive brake actuators and active linear motion actuators. DTIC

N94-18244# Oak Ridge National Lab., TN.
HUMAN RELIABILITY ANALYSIS APPLICATION GUIDE
May 1993 107 p
(Contract DE-AC05-84OR-21400)
(DE93-015361; ES/CSET-16) Avail: CASI HC A06/MF A02

Martin Marietta Energy Systems, Inc., (MMES) is engaged in a phased program to update the MMES safety documentation for the existing DOE facilities it manages. This guidance for Human Reliability Analysis (HRA) is intended for use in probabilistic safety analysis of DOE facilities. It is intended to supplement the Facility Safety Evaluation Application Guide, CSET-10, (July 1991), and subsequent revisions. The primary intended use of the guidance is to support accident analysis in Phase 2 of the Energy Systems Safety Analysis Report Update Program (SARUP). However, the guidance can be used for any safety analysis that needs human reliability analysis. The human reliability analysis methods covered by 'how-to' sections of the guide are direct application of or adaptations of methods developed for Probabilistic Risk Assessments (PRA) of nuclear power plants. The adaptations of these methods were designed to make the methods more suitable to DOE non-reactor applications. The methods have been adapted for use by the personnel who will perform the accident analysis task. This has been done by furnishing guidance intended for accident analysts who are experienced in human reliability analysis and by providing various methods of several levels of complexity and sophistication that lend themselves to a graded approach. The methods also lend themselves to progressive, iterative refinement so that the more burdensome versions of the methods may be reserved for use only when the importance to safety of the human reliability issues clearly warrants the time and effort. The recommended technicues build upon logic models of the human interactions with the facility that contribute to accident sequences. The recommended techniques employ assessments of a catalog of Performance Shaping Factors (PSF's) that influence the reliability of operating crews in carrying out their activities. DOE

N94-18296# Army Aeromedical Research Lab., Fort Rucker, AL.
ANALYSIS OF SEATING AND RESTRAINT LIMITATIONS RESTRICTING TOTAL BODY WEIGHT FOR AIRCREW AND PASSENGERS ON US ARMY HELICOPTERS
JAMES E. BRUCKHART, JOSEPH R. LICINA, SAMUEL G. SHANNON, and JOSEPH L. HALEY Jul. 1993 23 p
(Contract DA PROJ. 3M1-62787-A-878)
(AD-A269117; USAARL-93-26) Avail: CASI HC A03/MF A01

Aviation Life Support Equipment (ALSE) and crashworthy seating protect the crew and passengers in military aircraft. If the user exceeds the design weight or size range for personal protective equipment, it may not function properly. The distribution and changes in body weight and relevant anthropometric measures were evaluated for soldier and aviator groups. Current ALSE and aircraft restraints were surveyed to determine the largest available sizes. Each aircraft seat was evaluated to determine the crash strength and maximum allowable weight for a given crash pulse. The 99th percentile male soldier and aviator weigh 237.5 and 228.2 pounds, respectively. The average body weight increases with age for the male aviator population. The largest available flight suit (size 48L), SRU-21/P survival vest, and webbing restraints accommodate a 47-inch waist circumference. DTIC

N94-18394# Air Force Occupational Measurement Center, Randolph AFB, TX.
AIRCREW LIFE SUPPORT, AFSC 122X0(1T1X1) Occupational Survey Report
Aug. 1993 75 p
(AD-A268998; AFPT-90-122-956) Avail: CASI HC A04/MF A01

As described in the AFR 39-1 Specialty Descriptions for AFSC 12210/30/50, 3- and 5-skill level, members are responsible for inspecting and maintaining aircrew life support and aircrew chemical defense equipment; inspecting, maintaining, installing, and removing life support equipment on aircraft; issuing, fitting, and adjusting aircrew life support and chemical defense equipment; assisting aircrews to don, doff, and preflight pressure suits, antiexposure suits, and aircrew chemical defense equipment; conducting aircrew chemical defense decontamination and shelter processing; and instructing aircrews on purpose, operation, care, and use of equipment as well as chemical decontamination, bail out, and ejection procedures. DTIC

N94-18412# Air Force Flight Test Center, Edwards AFB, CA.
REVISION AND VERIFICATION OF A SEVEN-POINT WORKLOAD ESTIMATE SCALE Technical Information Manual, Jan. - Jun. 1992
LAWRENCE L. AMES and EDWARD J. GEORGE Jul. 1993 35 p
(AD-A269194; AFFTC-TIM-93-01) Avail: CASI HC A03/MF A01

This technical information memorandum presents the results of an AFFTC effort to revise and verify the technical characteristics of a seven-point workload estimate scale. The original scale was the School of Aerospace Medicine (SAM) Form 202. From the results of the revision effort, it was concluded that the AFFTC revised workload estimate scale would be suitable for flight test applications. DTIC

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A94-10126* National Aeronautics and Space Administration, Washington, DC.
ALDEHYDES IN HYDROTHERMAL SOLUTION - STANDARD PARTIAL MOLAL THERMODYNAMIC PROPERTIES AND RELATIVE STABILITIES AT HIGH TEMPERATURES AND PRESSURES
MITCHELL D. SCHULTE and EVERETT L. SHOCK (Washington Univ., Saint Louis, MO) Geochimica et Cosmochimica Acta (ISSN 0016-7037) vol. 57, no. 16 Aug. 1993 p. 3835-3846. refs
(Contract NAGW-2818)
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Aldehydes are common in a variety of geologic environments and are derived from a number of sources, both natural and anthropogenic. Experimental data for aqueous aldehydes were taken from the literature and used, along with parameters for the revised Helgeson-Kirkham-Flowers (HKF) equations of state, to estimate standard partial molal thermodynamic data for aqueous straight-chain alkyl aldehydes at high temperatures and pressures. Examples of calculations involving aldehydes in geological environments are given, and the stability of aldehydes relative to carboxylic acids is evaluated. These calculations indicate that aldehydes may be intermediates in the formation of carboxylic acids from hydrocarbons in sedimentary basin brines and hydrothermal systems like they are in the atmosphere. The data and parameters summarized here allow evaluation of the role of aldehydes in the formation of prebiotic precursors, such as amino acids and hydroxy acids on the early Earth and in carbonaceous chondrite parent bodies.

N94-10865*# Cornell Univ., Ithaca, NY.
PREPARING FOR THE INITIAL OBSERVATIONS OF THE TARGETED SEARCH AND THE SKY SURVEY SYSTEMS Final Report
MICHAEL M. DAVIS 20 Jan. 1993 2 p
(Contract NAG2-696)
(NASA-CR-193644; NAS 1.26:193644) Avail: CASI HC A01/MF A01

During this period, the SETI project prepared for the initial observations with both the Targeted Search and Sky Survey systems. I am nominally a member of the Targeted Search team, but participated actively in both parts of the project. My activities were concentrated primarily in three areas: coordination with Arecibo Observatory in preparation for the initial observations on October 12, 1992; development of a design concept for confirming observations; and participation (at JPL) in a design review of the rf system. Derived from text

N94-13086*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE/HIGH RESOLUTION MICROWAVE SURVEY TEAM MEMBER Semiannual Status Report No. 5, 1 Mar. - 31 Aug. 1993
PAUL G. STEFFES 1993 61 p
(Contract NAG2-700)
(NASA-CR-194177; NAS 1.26:194177) Avail: CASI HC A04/MF A01

This semiannual status report describes activities conducted by the Principal Investigator during the first half of this third year of the NASA High Resolution Microwave Survey (HRMS) Investigator Working Group (IWG). As a (HRMS) Team Member with primary interest in the Sky Survey activity, this investigator attended IWG meetings at NASA/Ames and U.C.-Santa Cruz in Apr. and Aug. 1992, and has traveled independently to NRAO/Kitt Peak, Arizona (April 1993) and Woodbury, Georgia (July 1993). During the July 1993 visit to the Georgia Tech Research Corporation/Woodbury Research Facility, an experiment was conducted to study the effects of interference from C-band (3.7 - 4.2 GHz) geostationary spacecraft on the Sky Survey operation in that band. At the first IWG meeting in April of this year, results of a SETI observation conducted at the 203 GHz positronium hyperfine resonance using the NRAO facility at Kitt Peak, AZ, were presented, as well as updates on the development of the spaceborne RFI data bases developed for the project. At the second meeting, results of the study of interference from C-band geostationary spacecraft were presented. Likewise, a presentation was made at the accompanying 1993 Bioastronomy Symposium describing the SETI observation at the positronium hyperfine resonance.
Author (revised)

N94-16620*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI)
JOHN BILLINGHAM *In* BioTechnology, Inc., Proceedings of the 1992 Annual Meeting NASA Occupational Health Program p 143-151 Jul. 1993
Avail: CASI HC A02/MF A03

Various aspects of project SETI are discussed. Some of the topics discussed include spectrum analyzers, signal processing, sky surveys, radiotelescopes, high resolution microwave survey, Deep Space Network, and signal detection. CASI

N94-17017*# National Aeronautics and Space Administration, Washington, DC.
PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1991: A SPECIAL BIBLIOGRAPHY
Oct. 1993 64 p
(NASA-TM-4483; NAS 1.15:4483) Avail: CASI HC A04/MF A01

This document contains a list of 1991 publications resulting from research pursued under the auspices of NASA's Exobiology Program. Author (revised)

N94-17636*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ONTOGENESIS OF MAMMALS IN MICROGRAVITY
O. G. GAZENKO, ed. (Academy of Sciences, USSR, Moscow.) Apr. 1993 167 p
(Contract RTOP 106-10-04)
(NASA-TM-103978; A-92192; NAS 1.15:103978) Avail: CASI HC A08/MF A02

This report is an English translation of a Russian report prepared by a group of authors from the USSR, Bulgaria, Hungary, the GDR, Poland, Czechoslovakia, France, and the USA. It presents results of the first microgravity experiment on mammalian embryology performed during the flight of the biosatellite Cosmos-1514 and in ground-based simulation studies. An overview is provided of the data available about the role of gravity in animal growth and development, and future studies into this problem are discussed. A new introduction has been provided for the English version. Author (revised)

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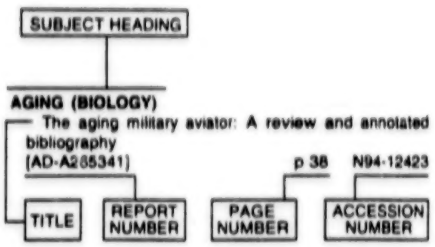

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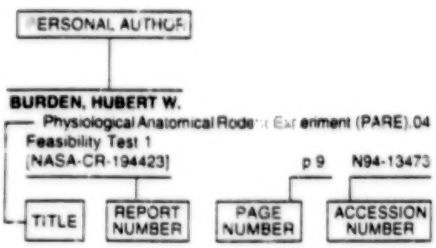

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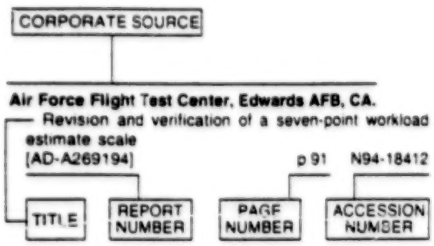

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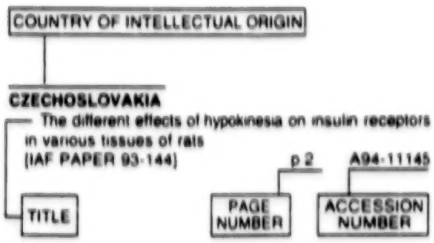

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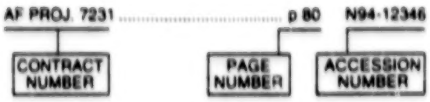

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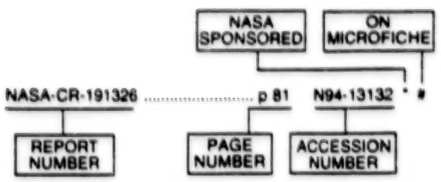

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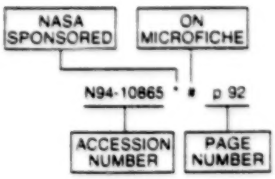

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